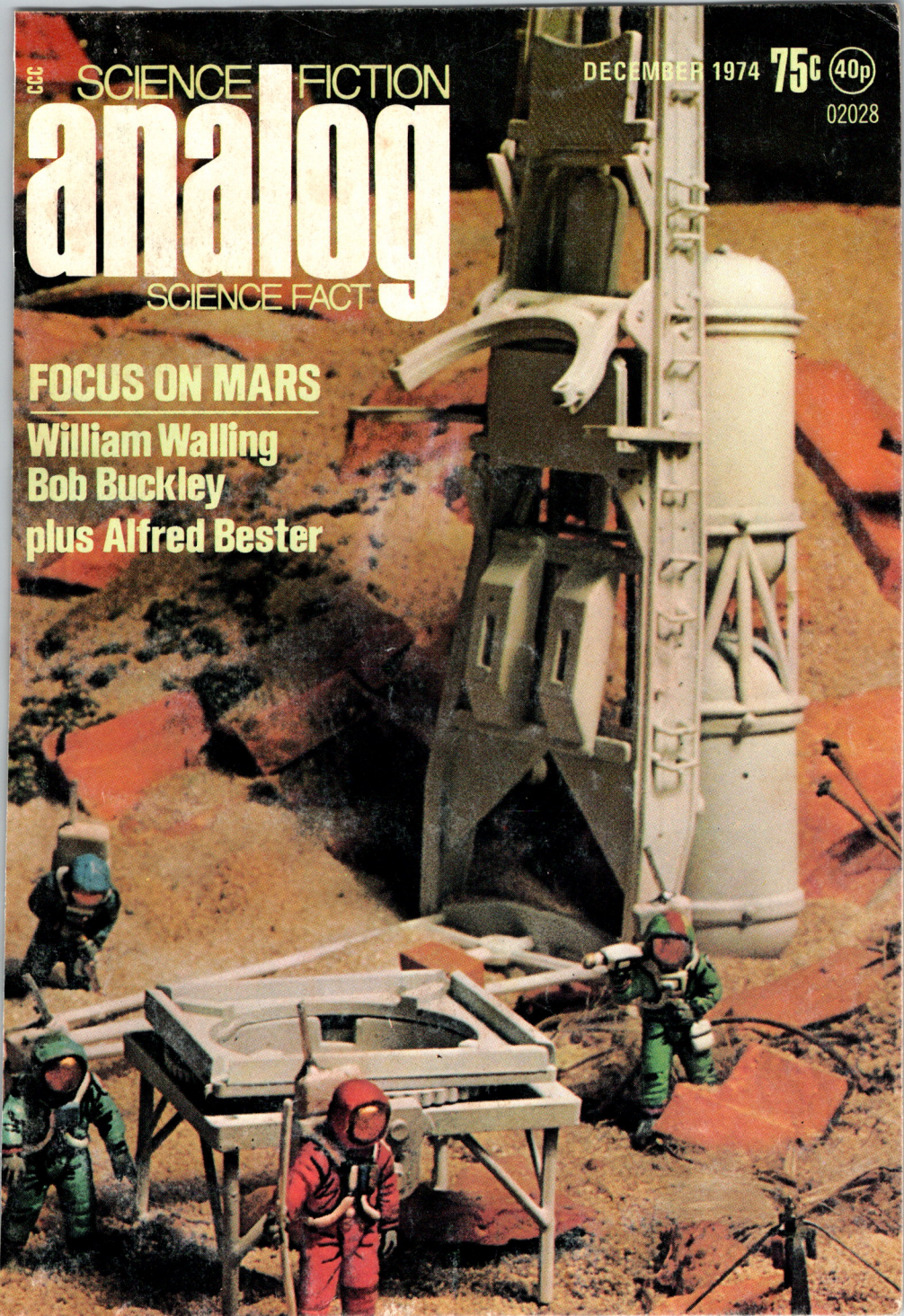
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A Calendar of Upcoming Events

November 29-December 1, 1974: INFINITY 74, Commodore Hotel, New York City. Theme: Extraterrestrials. Registration: $4 until November 1; $5 after. Info: Joe Rizzo, 21-68 41st Street, Astoria, New York 11105.

December 5, 1974: Space Shuttle and Modular Space Station Programme (lecture), London, England. Info: Executive Secretary, British Interplanetary Society, 12 Bessborough Gardens, London SW1V 2JJ.

December 10-December 13, 1974: American Astronomical Society, 144th Meeting, Gainesville, Florida. Info: L.W. Frederick, Leander-McCormick Observatory, Box 3818 University Station, Charlottesville, Virginia 22903.

December 13-December 15, 1974: PHILCON (Philadelphia science fiction convention), Benjamin Franklin Hotel, Philadelphia, Pennsylvania. Registration: $4 in advance; $5 at door. Info: Gale Burnick, 4300 Spruce Street (Basement), Philadelphia, Pennsylvania 19104.

December 26-December 28, 1974: Seminar on Science Fiction, Modern Language Association (MLA Conference), New York City. Info: Professor David Samuelson, Department of English, California State University, Long Beach, California 90840.

August 14-August 17, 1975: AUSSIECON 75: (33rd World Science Fiction Convention), Southern Cross Hotel, Melbourne, Australia. Guest of Honor: Ursula K. LeGuin; fan guests of honor: Mike and Susan Glicksohn. Registration: $3 supporting; $10 attending. Info: Box 4039, Melbourne 3001, Australia. US agents: Jack Chalker, 5111 Liberty Heights Avenue, Baltimore, Maryland 21207; and Fred Patten, 11863 W. Jefferson Boulevard, 1, Culver City, California 90230. Canadian agent: Richard Labonte, 64 Marlborough Avenue, Ottawa K1N 8E9, Ontario.

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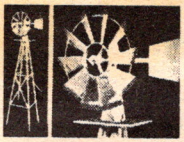

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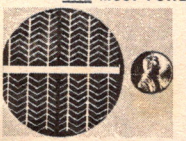

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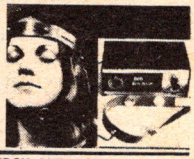

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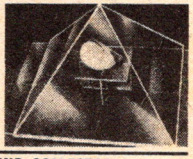

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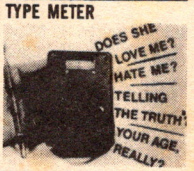

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DESTINATION **MARS**

Mars is waiting for us.

How many of us first "turned on" to science fiction by reading about the Mars of Edgar Rice Burroughs? Or Stanley G. Weinbaum? Or Ray Bradbury?

And how much of the public's waning interest in space exploration is upheld by the chance of finding life somewhere on the Red Planet?

In this issue of Analog, we present three pieces of fiction, a science fact article, and a special feature—all of them about Mars. Not Burroughs' Barsoom, nor Weinbaum's abode of the ancient Egyptian gods, nor Bradbury's site of bone-chess cities. The Mars we describe today is NASA's Mars, the planet revealed by the Mariner space probes.

The Mars that may kill the space program.

As Richard C. Hoagland shows in his science article, there is a strong possibility that the Viking probes which will be launched next year to soft-land on Mars in 1976 will not—repeat, NOT—find life on the Red Planet. Hoagland also shows how this disappointment could permanently end the space program; or at least, the exploratory spearhead of it.

To understand fully how this might happen, we must look at the history of the space program, and then extrapolate two possible future scenarios.

America's efforts at exploring interplanetary space began with a space race, but it wasn't the well-publicized Space Race (note the capitalization) that was epitomized by the Apollo lunar landing program. The *real* space race was conducted mostly in secret, beginning in the early 1950's. It was only on October 4, 1957, when the Russians successfully orbited Sputnik I, that the race came out into the open. And even then, only the smallest tip of the iceberg was seen by the general public.

The real space race was a contest to see if Soviet Russia could deploy a strategic strike force of ICBM's before the United States could. The Russians got a long lead on us, mainly because of the differences in interpretation that the two different national governments placed

on the scientific advice they received from their expert advisers.

At the end of World War Two, both superpowers closely examined the future potentials of the two most awesome weapons to come out of the war: nuclear bombs and long-distance rockets. Two nuclear bombs had ended the war. Earlier, German V-2 rockets had proved to military men—and the helpless citizens of London—that there was no defense against rockets that flew at many times the speed of sound.

The US assessment of these weapons was led by Vannevar Bush, who had headed the Office of Research and Development during the war, an organization that had spearheaded the development of proximity fuses for artillery and rocket-assisted takeoff boosters for aircraft. Bush concluded that nuclear bombs will always be too heavy and bulky to be lifted by rockets; it would be foolhardy, he reported to the Government, to expect rockets *ever* to attain the payload capacity and accuracy needed to make them useful nuclear weapons delivery systems.

So American rocketry languished, even well into the 1950's, using captured V-2's and a few newly-developed single-stage rockets for very limited high-altitude sounding flights. American rocket technology never moved beyond about 200 kilometers' altitude in those years.

The Russian assessment of the same basic facts came to a very different conclusion. Since nuclear weapons would always be heavy and bulky, they decided that they had to develop very large rockets to carry them accurately across 10,000-kilometer ranges. The Russians pushed ahead with *big* rockets.

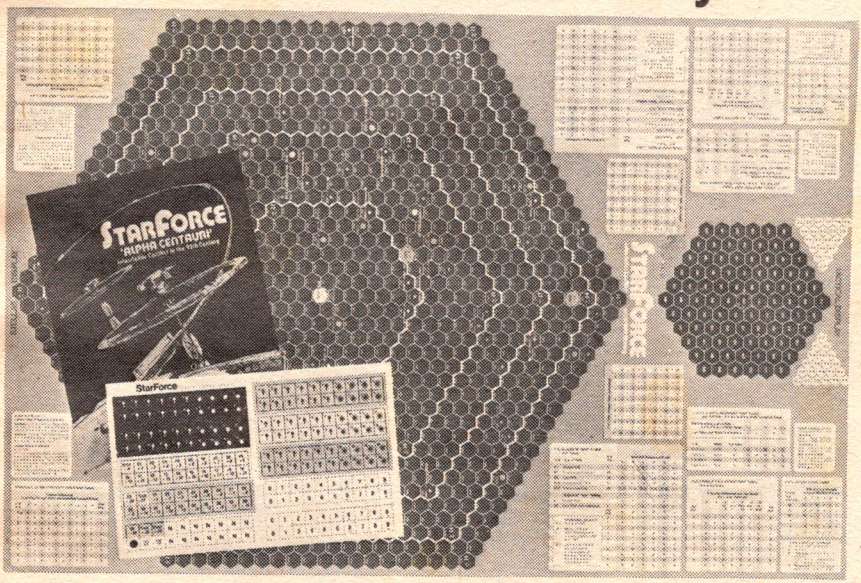
Incidentally, the basic premise of these studies turned out to be unrealistically pessimistic. Nuclear weapons became smaller, and more potent, as weapons development programs progressed in both nations.

By the mid-1950's the Russians were flight-testing ICBM's and the US was conducting a frenzied, secret crash program to close the lead that the Russians had established. If the Russians could field enough operational ICBM's to do severe damage to the US before we could produce a comparable force to counterbalance their threat, the tide of the Cold War would swing to their side. Perhaps permanently.

Thus, there was a "missile gap" in the mid-1950's, although by the time the phrase became popular enough to be a part of the 1960 Presidential election campaign, the gap had been closed considerably. Thanks to the last crash program the US military-industrial complex ever mounted, the Russians never gained a big enough lead to really threaten us. Today, sophisticated analysts argue among themselves over which side has the stronger nuclear strike force.

STARFORCE

Interstellar Conflict in the 25th Century



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The Russians, realizing that they were not going to attain a clear-cut military superiority, turned the race into one of international prestige. They used their big, reliable boosters to launch the first Sputniks and Luniks. America's response to this sudden change of pace was too little and too late. As a technical editor on Project Vanguard, I know first-hand how poorly we did in the opening phase of the (capitalized now) Space Race.

President John Kennedy focused the US space program on the target of a manned lunar landing: Project Apollo. He did it for a variety of reasons, mostly political, as all superior statesmen do. Once focused, the space program could be pushed through the Congress as a means of recapturing America's lost prestige It succeeded in doing that—and much more. Practically *all* of the space exploration that's been done since the early 1960's, including the unmanned scientific probes to the planets, is a very real spinoff from the Apollo program. Without Apollo to convince the Congress that billions were needed for space, the smaller programs such as Mariner and Pioneer would have quietly died. Pure science never fared well in Congress.

The Russians dropped out of the Space Race. We landed on the Moon more than five years ago, and to date the Russians are still having difficulties with long-duration missions in orbit around the Earth.

So much for history.

A brief note about the present. July 20, 1974, was the fifth anniversary of Apollo 11's touchdown at Tranquility Base. It slipped past with hardly a murmur from the nation's press and communications media. True, all eyes were focused on Watergate and the Middle East. But except for a CBS-TV documentary by Walter Cronkite, a self-confessed "space buff," there was scarcely a word about that historic date.

One thing Cronkite did mention, however, was in answer to all those who decried the twenty-some billion dollars spent on Apollo, shouting that it should have been spent "on the poor." He pointed out that during the same period of time that Apollo was running, the Federal Government alone spent more than 560 billion dollars on social and welfare programs.

Now for the future.

One possible scenario, explored by Hoagland in his fact article, is that the Viking landers will not find evidence of life on Mars, even though life exists on the planet. The reaction to this negative information could be disastrous for the space program.

After all, the first part of the space race—the secret race—is still fixed in the public's mind as the famous Missile Gap of the 1960 Presidential campaign: a gap that

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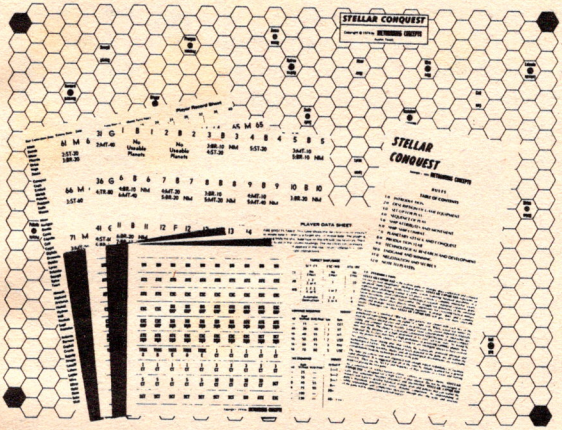

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turned out later to be nonexistent. At least, most voters think it was nonexistent. Then came the wildly ballyhooed Space Race for the Moon. When the Russians bowed out, after realizing they were being embarrassingly outdistanced by the Apollo program, the public and politicians again felt that they had been hoodwinked into spending billions of dollars on a "Moondoggle."

NASA no longer has competition with the Russians to wave in front of the Congressional appropriations committees. A strong part of their annual sales pitch now is the search for life on other worlds. Should the Viking probe of Mars prove negative, even this somewhat shaky support will be knocked out from under NASA's platform.

The politicians, coached by those who never wanted a space program in the first place, will reason that there's no life on the Moon, Venus is a redhot inkwell, and Mercury is barren. Now, if Mars seems devoid of life, why spend all that money on dead chunks of rock? Just because the scientists are curious? Spend it on programs that will earn votes!

The exploration of the Solar System will cease. All right, but there will still be a space program. We'll still have operations in near-Earth orbit: the practical kinds of communications and observation satellites that everybody "knew all along" would be useful.

But human society is not static, and neither is technology. Without the impetus of new challenges, both society and technology wither. If the exploratory part of the space program dies, we will never get to develop the hardware we will need to reach the Moon with large payloads, or to reach outward to the planets. We will never even begin to exploit the natural resources of the other worlds of the Solar System, resources that our Earth will desperately need in the next century.

And there will be no second chance. If we don't reach out to the Solar System now, by the time we have gutted our own world and realize that we must seek resources elsewhere, we'll have neither the resources nor the energy to explore the remainder of the Solar System and utilize the wealth that lies there waiting for us. The next few decades are the critical decision-making time for the human race: either we grow up and reach out into the Solar System, or we collapse from lack of resources and energy and revert to the Middle Ages, or further. If we don't take the steps today that will make us a spacefaring race, humankind will be locked forever into a planet-bound existence, and eventually will become as extinct as the dinosaurs.

The second scenario is brighter.

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and the electrifying effect the discovery of life on Mars will have. The space program will not only continue, it will be enlarged and accelerated. Good ideas that are now languishing for lack of interest will be revitalized. Above all, new propulsion techniques that will cut down the costs of spaceflight will be developed, including nuclear rockets, electric propulsion, and even laser propulsion.

The cry of "On to Mars!" will be virtually irresistible.

There is a third alternative, and one that we must prepare for. Like a good general, we must be ready to face reverses, and prevent setbacks from becoming permanent defeat. This means that we who understand the value of the space program, and realize how much it means to humankind's future, must be prepared to weather the storm of negative reaction to a "failure" of the Viking program. Even if life is not found on Mars, we must push for a continuation of space exploration, and continued development of space hardware.

There are two programs underway today that can provide the basic framework for a strong and successful future space program. They are the joint Apollo-Soyuz mission, planned for 1975, and the Space Shuttle, scheduled to begin operations in the early 1980's.

The Apollo-Soyuz mission is more symbolic than anything else. But it is symbolic of an important change in our attitudes. Instead of competing against each other, America and Russia can cooperate in space efforts. The costs of space operations can be halved, if the two nations can learn to cooperate fully. And more than halved, if Europe, Japan, and all other interested nations share in a single worldwide program that is truly by, for, and of the people of Earth.

As John Kennedy pointed out long ago, "United, there is little we cannot do in a host of cooperative ventures; divided, there is little we can do . . ."

The Space Shuttle is designed to cut down the costs of putting payloads in orbit. It will be the workhorse of the Eighties. While all the spacecraft flown so far can be likened to hand-tooled sportscars, the Shuttle will be a truck—built to carry loads from Earth to orbit economically, reliably, and repeatedly.

The Shuttle will be reusable. Up until now, astronauts and cosmonauts have flown into space in a wildly extravagant style, using throwaway, one-time boosters and spacecraft. Imagine using the same technique to travel from New York to Melbourne. You'd take an aircraft carrier as far as Capetown and sink it there, after taking off from it in a jet plane, which you ditch in Melbourne harbor so that you can complete your journey in a rubber raft.

Unless the foes of space efforts have their way in Congress, the

Shuttle will be carrying men and women to work in the 1980's. Not just the astronauts who pilot the bird, but construction crews who will build the permanent manned space stations of the Eighties, astronomers, physicists, physicians, technicians, therapists, patients, engineers, tourists. Perhaps even a few science fiction writers.

With the Shuttle as a beginning, and a strong international space program pushing the development of ever-more-efficient propulsion systems, the rest of the Solar System can be opened up to us. We will be able to take the first steps in ending the man-made erosion of our planet, by utilizing the environment of space as a site for our industry, and as a source of energy and raw materials.

What better way to symbolize this new era of human existence than to mount an exploratory mission to Mars, manned (and womaned) by people from many nations: a true expedition from Earth, not from any single nation.

That future can be open to us, even if Viking reports negative results. But only if we are ready to counter the short-sighted arguments of those who will seize on a "failure" of Viking as an excuse for strangling the space program.

For better or worse, Mars is the symbol of our future, the place where our best dreams—or worst fears—will be realized.

THE EDITOR

photos by: Bill Westfall

ELECTRONIC JEWELRY

By Kleiner Labs

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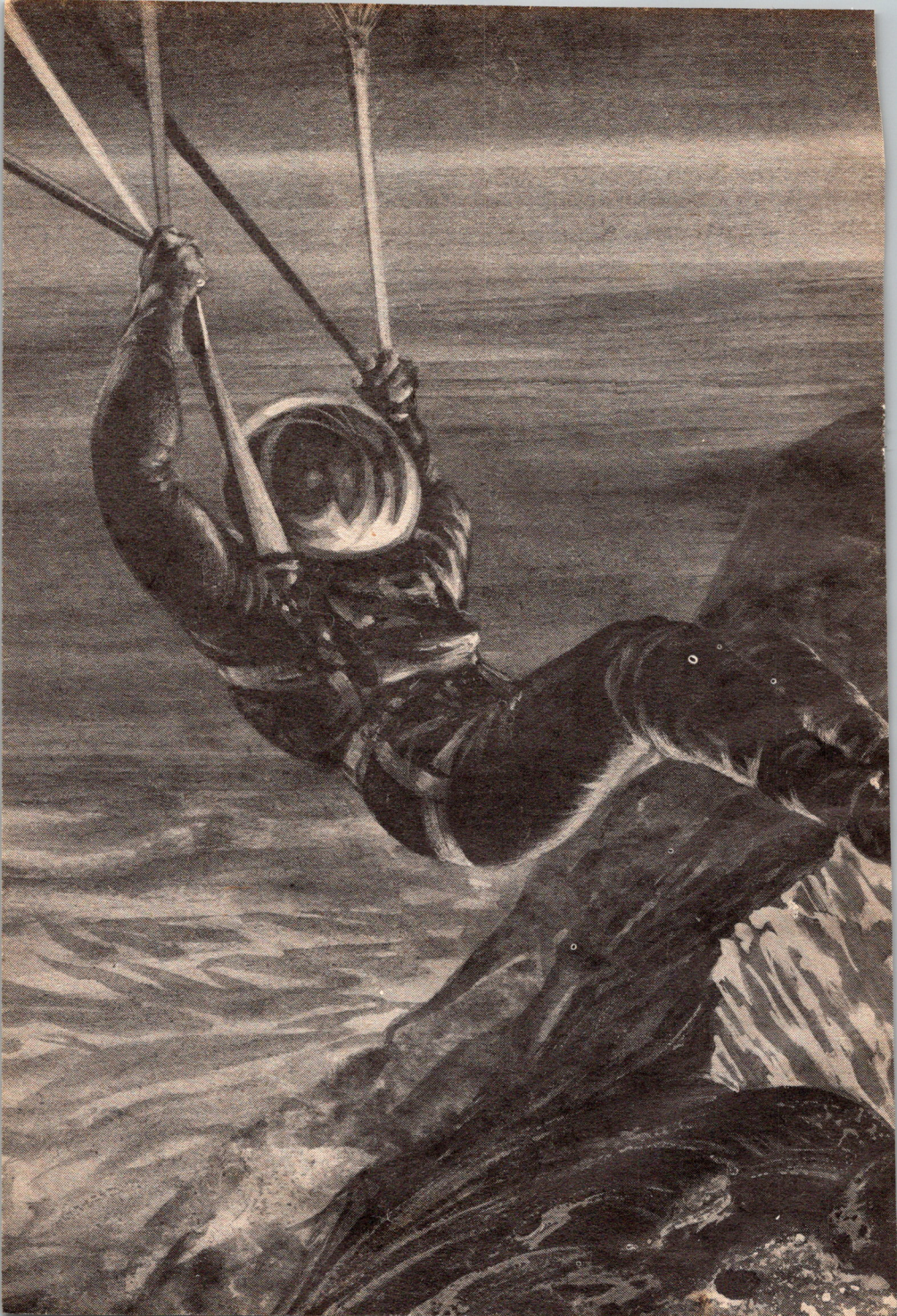


NixOlympica
To make a self-sufficient colony
you need self-sufficient people.
WILLIAM WALLING
KELLY FREAS

The inaugural ceremony was being piped sunward live for Earthside propaganda purposes. "Live," that is, if you discount the seven light-minutes our signal requires to bang Goldstone's ear in the far off Mojave Desert.

The Founding Fathers at Biblis Fons, 160 kilometers south of Olympic Base, where Jesperson and I had halted the crawler and ducked inside to watch the show on a small raster monitor, elected to open the proceedings with our new "anthem": the Mars theme from an astrology-inspired mish-mash called *The Planets* by the English composer, Gustav Holst.

Or so Jesperson told me. Jess knows about such things; guess I tend to lean on his answers—up to a point. "You're joshing," I said. "An *Englishman* with a moniker like Holst?"

"Shush, Barney!" Jess put a finger to his lips.

Huh, some anthem! You could not hum, whistle, or sing the damned thing. The music is all brass and thunder; but compelling in a monotonous, grinding way. In that respect, I suppose it does typify Mars.

At the fadeout, our erstwhile chief medic, Deputy Director-elect Hiroshi Yokomizo, nervously cleared his throat at the rostrum. Yokie is a happy troop; even when arguing with someone, his rhetoric spills through a cherubic grin. Now, facing the camera and flushed with the dignity of his new office, I hardly recognized him. He tried to give the impression of addressing some large gathering rather than ninety leathery, half-starved Mars-rats—those who bothered to stop work and turn on their video receivers, at any rate—and twenty-seven children . . .

Wait, make that eighty-nine Marsrats. Mrs. What's-her-name, that nice Eskimo lady, had been found frozen to death outside West Tunnel just last week, no? OK, eighty-nine, then. Counting Jess and me.

But twenty-seven kids there were—hardy, resilient little devils Victor Gonzalez likes to call Mars-*ratons.* One of them is mine—mine and Lorna's. Inflicting Mars on one child seemed crime enough; Lorna and I have made sure that we will never have another.

All but four of the children were born under the roofed crater of Biblis Fons, where the harsh, unrelenting, ocher plain of Mesogaea gives way to the harsh, unrelenting, ocher plain of Tharsis. As if you could tell the difference.

Step outside the ringwall—not forgetting your humidifier rebreather, summer parka, and UV cloak—and you'll see the wan sun standing in a sky that shades subtly from powder blue to sable only a few degrees above the too-near horizon. Should you be foolhardy enough to venture out into the bone-chilling night, best remember

to wear thermal underwear and your heaviest parka; and by all means check the electrolyte level in your pack batteries before you leave, else be discovered lying stiff and brittle under the unwinking stars, like nice Mrs. What's-her-name.

Jesperson and I hung in there, attentive to what Yokie was saying, until he began trumpeting Vonex Corporation, the giant North American conglomerate who originally "sponsored" our brave, non-profit new world (gleefully filing for hundreds of millions in tax write-offs the while). Yokie's pitch had been wrung from Vonex recruitment brochures: "—a self-sustaining bastion of humanity; a nucleus-society, protected from Earthly population pressure and the ever-present fear of Armageddon—" and so on.

Which earned him a flatulent raspberry from Jesperson. Jess and I had heard that "self-sustaining" crap once too often.

Except for exotic drugs, medicines and chemicals we can't yet produce, the colony today is totally independent of Earth—until the bolide with our number on it comes along, or the cold gets us, or the constant ultraviolet bath, or we run out of precious water.

Or until Nix Olympica wakes from ancient slumbers and blows its cloud-wreathed top again.

Jess and I were getting the fidgets. Doc Yokomizo made mention of the remarkable strides our engineering and agronomy staffs had made during the past year—our year: 686.996 E-days, to be exact. Without further preamble, he introduced Director-elect Scheierkopf.

"Ten-hut!" said Jesperson. "Our Leader speaks."

"Softly," I said with a grin. "Let's show some respect."

Jesperson snorted. Scheierkopf, an energetic, loquacious gnome, belongs in an emeritus chair of philosophy at some ivied university. He eased into his discourse the way a landlubber eases into chilly water—by way of a folksy anecdote (probably invented, because I recall no such incident) concerning the colony's clogged drains last fall. Scheierkopf laid it on even more thickly than had Yokomizo: pure Vonex party line, and a waste of breath. Nine out of ten Earthbound consumers think of Marsrats as freaks. They're probably correct.

The speech turned us off. Jesperson flinched when the old geezer dwelt on "humanity's bright future on Mars." And, dammit, he kept referring to us as "Mars-rationalized humans" instead of Marsrats, which for some reason grates on the ear like a hangnail on a blackboard.

When you finally leave the isolated processing ward at Bevvins Clinic in Christchurch, New Zealand, and they hoist your sealed capsule aboard the SST for the flight to the Pacific Launch Site op-

erated by Vonex near Hawaii, they stamp "Mars-rationalized" across all your papers. It should be written in blood, or better, engraved on platinum foil and bonded to your forehead.

It's a one-way street, brother! You can't go home again.

The first Viking unmanned lander resolved all "Is there life on Mars?" speculation by hanging a nutrient-covered palette in the alien breeze. A few nosy microbes obliged, deciding they liked the glop. They multiplied and were fruitful, sending waves of telemetered ecstasy up the spines of Earthly scientists. Much later, Martian bacteria were found to be few and far between. They operate on a different wavelength from their Earthly cousins, and seem to want nothing to do with us. Which is maybe just as well.

Aside from microscopic bugs, a few lichens, mosses and such cling desperately to existence here and there in places sheltered from the ravening winds and the sand which flies before them, from constant, high-energy ultraviolet irradiation, from the abysmal cold. That's it—period.

Plus we Marsrats, of course. Or what's left of us.

One by one, the manned expeditions attacked Mars' hairy environmental problems: the -140° F winter nights—even here, near the equator—the intense UV blast, the utter absence of free water on the surface. Our skimpy atmosphere contains ninety-four percent carbon dioxide, with traces of oxygen, ozone and other gases—a honey of a problem for oxygen breathers, a problem whose solution demanded true genius.

Luckily, one came along. An obscure cellular physiologist named Bevvins was solely responsible for opening Mars to colonization. About fifty E-years ago, aboard a research satellite orbiting Jupiter, Bevvins gambled with an experimental enzyme he'd been developing under the cloak of government security—one of those projects which are often funded, then forgotten. Dr. Bevvins gambled and won. The wraps came off Bevvinase, the Miracle Enzyme which enables conversion of carbon dioxide to oxygen *en vivo,* the way plants do it. We now have Mars-rationalized trees, plants and stock animals. Not to mention a passel of useless, necessary dogs and cats.

The pets are also CO_2-breathers. Forever. A hell of a long time, forever. Any way you look at it.

"Had enough?" Jesperson glanced at me, one hand on the monitor's control panel.

"Kill it, Jess."

"We'll miss the pomp and circumstance," he said. "The UN Secretary General is going to swear-in Scheierkopf and Yokomizo by proxy."

"What a kick in the head! Come

on; let's get truckin' for home. I'm tired." I was also disenchanted with Scheierkopf's version of Hearts and Flowers.

Jesperson hit the off-switch. He rubbed his jaw for a moment, stewing about something. Then he switched the monitor on again, diddling with the selector knob until the basalt curtain-wall of Nix Olympica's lower cliffs grew to fill the screen.

We were much too close to see more than a smidgen of the volcano, having just returned from inspecting the lower still pipe, and the windmills which power the heaters. The trickle of water we get from Nix Olympica's "still" (it's not really that, but we've called it a still too long to change) is what keeps Biblis Fons alive.

"I'll climb that mother some day," said Jesperson in a wistful tone. "I swear I will."

"Sure." I laughed aloud. "You'll sprout wings and fly, too."

Jess took no offense; we'd had this conversation before. He studied the image; the cliffs reared like a collage of landscapes from some King Kong movie—furled, ruggedly convoluted ropes of lava drip that had serpentined down ages ago from high above. The scarp at the volcano's base rises about sixteen thousand feet above a layered pediment.

"I mean it," said Jesperson.

And he did mean it. Jesperson speaks his mind. A hard guy to get acquainted with, he's a moody, intense, overeducated Marsrat; lean and UV-irradiated and parchment dry as everyone else on this dustball. His conversation—what there is of it—tends to be laced with acid.

Like me, Jess had had an unhappy Earthside experience. He would righteously deny ever confiding it to a soul, but he would be wrong. Some years ago, when in his cups, he'd babbled the tale to me. Employed by a "government agency"—the kind that never gets talked about—he had somehow come to do less than was expected of him. A girl was involved (aren't they always?) and a strip of microfilm which he'd let stray into the wrong hands; all very fuzzy and cloak-and-daggery. His boss had offered simple alternatives: a termination contract with prejudice, or Mars.

I know how Jess must have felt. The judge offered me a similar choice after the jury returned a guilty verdict. The other guy had provoked the brawl, so it was simple manslaughter, not murder two. At least I'd had no "termination" worries. But thoughts of ten years in the slammer when you're young . . . I was young, and black, and a helluva lot more arrogant in those days. Hizzonor did not care for arrogance; he cared for black people even less . . . It's a dull story.

Jesperson had chosen the one-

way trip to Mars—and found Nix Olympica.

In a few hours, after we had coaxed and wrestled the crawler down through the terraced uplands surrounding the volcano's base—which covers about the same area as the State of Nebraska, by the way—and rolled out onto the western edge of Tharsis toward home, we would be able to look back and see it all. Barring a sandstorm, we would see Nix Olympica's mighty summit lofting almost fifteen miles above the surrounding plains, wearing a perpetual crown of windblown water ice.

That's how the volcano got its name—Snow of Olympus. Sharp-eyed astronomers spotted the plume almost two centuries ago; someone of a classical bent—someone like Jesperson—hung the label on it.

The volcano obsessed Jesperson. It fascinated him the way a mongoose fascinates a cobra. He was aware that, by this analogy, he represented the snake, and that the mongoose never loses. I think that's why the challenge intrigued him so. He wanted the cobra to come out on top—just once.

The fact that Nix Olympica's forty-five-mile-wide caldera soared more than seventy-six thousand feet over our heads didn't seem to worry Jesperson in the least.

Don't misunderstand; many men have been up there. Thirty E-years ago, Vonex brought the big construction gang to Mars—two large manned vehicles, trailed by a staggered chain of radio-controlled freighter drones. Specially built VTOL Mars-landers dumped workmen and equipment onto the untrustworthy volcanic plug forming the caldera's floor. Another crew jury-rigged a small plant in the nearby desert and fused the sands of Mars into miles and miles of glass pipe. With heartbreaking difficulty, the upper pipe string was installed downhill from the catch basins and collection vats to meet the lower sections hoisted up from below. The pipeline dropped down the sheer fall of the cliffs, and ran out across Tharsis to Biblis Fons—our lifeline.

There is plenty of water *in* Mars, you see; almost none on its surface. Or in its atmosphere. Trouble is, Mars' free water is frozen beneath the deserts; we have no way of drilling for it—yet. Two principal exhalations of volcanoes are carbon dioxide and water; we certainly need both. Above all, water. The great shield volcano's deep inner fires melt subterranean ice; hundreds of thousands of gas-fed blowholes and vents dotting the southern slopes force water out where we can get at it. It freezes again, each night; the sun melts some of it—the little which doesn't evaporate—each day. The collection vats are filled with insulating tufa, so most of the catch stays liquid as it percolates deeper and deeper to the

manifold system which feeds the main pipe.

It was a high-risk project. Altogether, fourteen men lost their lives on the slopes of Nix Olympica.

Later, the construction guys erected the UV roof-shield over our crater, dumped the tons of raw materials, Mars-rationalized seeds, cuttings, dry-frozen foodstuffs and suchlike inside, and went home—rich. They'd earned their bonuses twenty times over, accomplishing all this while wearing cumbersome pressure suits.

But no one before Jesperson had ever seriously entertained the notion of *climbing* the monster.

Jesperson had done considerable rock climbing before his misadventure: the Dolomites in southeastern Europe, the Alps and, of course, California's Sierra. He and two companions had once climbed the northwest face of Yosemite's Half Dome "clean," using chocks and hand-set aluminum wedges instead of hammered pitons, to avoid spoiling the rock for those climbers who would follow. That's the kind of Marsrat Jesperson is.

When you get to know him.

We didn't bother with rebreather masks or UV cloaks for the short trot to the crawler. The summer afternoon was mild—I'd guess the middle forties, Fahrenheit—with a light wind from the southeast. An Earthly gale, but a mere Martian zephyr.

Most times, the Martian wind is a paper tiger—all sound and no fury. It whistles and moans and howls around your ears, but there's little "shove" behind it—too few molecules of gas per cubic centimeter to exert much force. In the summer, however, global convection patterns begin to create the sort of winds which lift millions of tons of dust into the thin air. Then, look out! The highest wind velocity ever recorded at Biblis Fons is on the order of 360 kilometers per hour. That happened during the Great Storm four summers ago which lasted three and one-half E-months, cloaking the entire planet in reddish-brown misery.

I once stung Jesperson into a scathing lecture by making the simple observation that no matter how damned fast it zipped past, our skimpy air shouldn't be able to power windmills or do the damage it did during sandstorms. He put me down with complicated force diagrams, a lot of jazz about Bernoulli Effects, the specific weight of air, gas dynamics, and how the computer at Biblis fluted or feathered the windmill vanes in proportion to wind velocity, and blah blah! Jesperson can be maddening when he gets wound up, but I'm used to him. The wind can be maddening, too, though it gives us plentiful power—our single ample commodity.

I energized the crawler and drove the first leg, while Jess

napped. The fuel cell gauges rode the green line; no sweat there. I found what was left of the ruts we had made coming out, day before yesterday, and turned south, hiking it up to fifty kilometers per hour until we reached the first declivity between terraces. The pipeline was a black line drawn across the desert; we passed whirling sentinel windmills powering the aqueduct's heaters.

Two hours later, Jesperson woke up and yawned. "What's for dinner?"

"Guess?" We agreed to stop and eat together.

Jesperson grabbed a pair of wineglasses from the cupboard with one hand, setting them on the collapsible table (everything which can possibly be fabricated from glass, is) then took down the remaining Zinfandel. We have wine, champagne and brandy; the grape cuttings processed in the San Joaquin Valley have done very well. But no beer or distilled spirits. Grains don't prosper here.

I dumped some of the goofy "Italian" dressing Lorna makes on a double handful of greens from the fridge, tossed them, and set the glass bowls on the table. Jess smeared bean spread on a few slices of ersatz bread and heated the onions.

Jesperson had just popped the glass cork, preparing to decant the wine, when the empty glasses began singing—a high-pitched, barely audible whine that made my pulse rate jump.

"Quake!" yelled Jess. "Grab hold of something!"

We didn't have time. A sledge hammer blow rammed the crawler sideways. I caromed off the edge of a forward foldbunk, then got knocked to the floor. The crawler danced and jittered for the longest time, accompanied by the crash of shattering glass and a series of frightful creaks and groans. Our crawlers were engineered for Mars' three-eighths G. I began to worry about whether this one would stay together.

Don't know how you feel about quakes. I'm agin' 'em; I grew up in southern California. My childhood memories are clouded by the helpless, choking terror that comes over you when the too, too solid ground you've taken for granted all your life begins to undulate like a shaken carpet.

The crawler finally quit pitching. The noise abated, leaving us canted about twenty degrees to port. In the sudden quiet, I was too scared to move.

Jesperson rose slowly across the cabin, picking pieces of my salad out of his hair. He cursed in a steady monotone. "You all right, Barney?"

I nodded. "I think so. Wh . . . why are we leaning?"

He went forward to find out. "Fissure! Quick, up here!"

I knocked my head on the table

getting up, then scrambled into the right-hand seat as Jess energized the crawler. We were sitting astraddle of a spooky-looking fissure that seemed to open slightly wider before it disappeared in the near distance. You couldn't see far; the wind had picked up loose sand and dust agitated by the quake and was whipping it hither and yon.

Our starboard track labored uselessly in midair; the other dug a sandy trench. The crawler lay stranded, bottomed on the lip of the crack. One portion of Tharsis now lay several feet higher than the other.

Jesperson tried rocking the crawler back and forth. No dice.

"We're stuck," I said inanely.

"An understatement, Barney." Looking very angry, Jess powered-down the crawler. "We'll have to dig the old girl out. Come along."

We were preparing to go outside when the second jolt hit—an aftershock of much less intensity or duration than the first. The crawler slewed to the left, coming to rest much nearer level than before.

Jess leaped forward and tried the controls again. This time, the tracks chewed and caught. We pitched down a bit, jolted once, then straightened and moved out into the open desert. The aft cabin was a mess, and smelled like a winery.

Jesperson kept to an easterly course for a minute or two, then swung around, heading back toward the fissure, and parked. "Whew! Let's stay away from that bleeding crack," he said. "There may be more subsidence later."

"Uh-huh." I still had the shakes. "What now?"

"Try to raise Biblis and see how much damage they've taken."

"Right." I switched the transceiver to daytime frequency, cranked the topside horn around to face south, and called, "Biblis, this is Cee Two—Charlie Two. Jesperson and Barnes. Do you read?"

Nothing. I tried twice more, then gave up. "They're off the air."

Jesperson shrugged. "Don't get nervous; it proves nothing. They're probably running around like trampled ants, just now. Leave the channel open, and . . ."

He stiffened. He sat far forward, bending sideways to peer upward through the bubble. "Oh, Jesus-my-beads! Look at *that*. The old devil's come alive."

I looked upward. A huge funnel of jet black smoke was pouring from Nix Olympica's distant summit, blowing away to the northwest across Amazonis.

That spurred us. Jesperson poured the watts to the crawler; we covered fifty kilometers in little more than forty minutes, the trip punctuated by aftershocks that forced Jess to slow down.

The ringwall was in sight, a humped mesa on the southwest horizon, when our call finally came. The speakers crackled twice as the carrier wave banged our horn, then

a voice with a Spanish accent said, "Crawler Two, this is Biblis. Come in, Cee Two."

"We're here, Gonzalez," I answered. "What's happening?"

"Hola muchachos!" said Victor Gonzalez. "You guys both OK?"

"Sure. How much damage is there in the crater?"

"Plenty damage," said Vic. "A couple of windmills are down up on the ringwall, and there were some injuries in North Slope—mostly sprains, bruises, broken bones and like that. Far as we know, thanks be to all the Saints, the roof-shield is intact. We didn't lose anyone, either. Least, I don't think so."

"Good. Glad to hear it, Vic. You can expect us at North Tunnel in about twenty min—"

"East Tunnel," said Jesperson from beside me. "Tell him East Tunnel; I don't want to cross the fracture zone if we can avoid it."

"As you were," I said. "Make that East Tunnel. Confirm."

"Got you, buddy," answered Gonzalez. "But you'll have to wait a little while in the lock at East. The inner doors are jammed; a crew with hydraulic jacks is working on them now. Want to come on around to South Tunnel? It's open."

Jess shook his head. "Negative. We'll wait."

"OK, *compañeros. Hasta la vista.*"

"Speak English, you Beaner!"

"Biblis, out." Gonzalez was chuckling as he signed off.

At the entrance to East Tunnel, Jesperson wheeled the crawler in a half-circle and powered-down. He hurried aft without a word, broke out the eight-inch folded Cassegrain reflector, came back and snapped it into the mount between our seats, then attached an image-erecting porro prism eyepiece. He aimed the 'scope, turning the vernier focus slowly, and studied Nix Olympica for a long moment in silence.

"Forget your goddam pet volcano," I said. "Let's get inside; I want to check on Lorna and the boy."

"Since we must wait anyhow," said Jesperson, his voice dripping sarcasm, "I'm going to take a look. D'you mind?"

I cracked my knuckles. It's hard to act patient when you don't feel patient. Presently, an aftershock made Jess lift his head from the eyepiece.

"Well?"

"See for yourself," he said.

The summit stood out clear and sharp at twenty diameters magnification. The 'scope was achromatic; no color. But bright threads glowed just beneath the caldera's enormous rim—streams of lava flow. "Bad news," I said, straightening.

"We'll see, Barney. It might be just a dribble; we're looking at the low side of the caldera."

"But you don't think so. You're worried."

"Stop putting words in my mouth. We'll have to see what happens up there tomorrow, the next day, and the next."

Jesperson stowed the telescope, came back and energized the crawler, and we trundled through the tunnel to the outer lock. When the doors parted horizontally, we entered and parked at the loading dock, alongside Crawler Four. The outer doors closed; pressure rose to match the seven-plus psig Biblis maintains internally.

We jumped down and stretched, moving into the alcove adjacent to the inner lock doors by unspoken agreement. Years ago, some wag hand-lettered a sign and mounted it over the archway:

SMOKERS LOUNGE

It's a tired joke. All of us took the pledge upon becoming Mars-rationalized. The pledge is woefully simple: carbon dioxide will not support combustion.

Jesperson dropped on a bench, immersing himself in a dark brown study. I couldn't sit still. I prowled about aimlessly, inspecting the photomurals I'd seen a thousand times before—a deep Swiss valley, East Africa's Serengeti Plain, the Grand Canyon dusted lightly with snow. My favorite is London in the rain—all that pure, clean water just falling from the sky. I haven't smelled or felt rain for seven E-years.

I paused before another mural. "Got a minute, Jess?"

"What is it?"

"Come see the funny word."

"Word?" He got up with reluctance. The photomural depicted a grove of northern California redwoods. Across the bole of a foreground tree, someone had scrawled a single nonsense word:

CROATOAN

"A prophet of doom," said Jesperson, "is in our midst."

"How's that?"

He sighed. "A long time ago, Elizabeth I commissioned Sir Walter Raleigh to found an English colony in the New World. He did; at Roanoke, Virginia."

"And?"

"When the next sailing vessel arrived, no one was there. Just that word, carved on a tree trunk."

"Huh! What's the word mean?"

"It's a conundrum," said Jesperson.

"I don't use 'em, man; had The Operation."

It actually made Jess smile—a first! "An anagram, then. It could be an anagram of Roanoke, albeit a lousy one. No one knows."

"Well, dammit, what happened to the colonists?"

"No one knows that, either. Roanoke became known as the Lost Colony."

I frowned. It was a chilling notion. "I'd like to meet the cheery bastard who disfigured our mural," I said thoughtfully.

Then the inner lock doors rumbled open. We walked into a shambles.

Walls were down everywhere. Luckily, most were nonstructural privacy partitions which could be re-erected with relative ease. I left Jesperson with a wave and hustled toward our place, inspecting the section of roof-shield overhead as I walked.

It's a staunch piece of engineering, our roof-shield: interlocking, shell-thin glass panels whose ribbed supports form a shallow Fuller Dome. Internal overpressure helps support it. The computer can cause any or all panels to become translucent or opaque in varying degrees—some polarizing monkeyshine I don't pretend to understand—to either admit radiant energy while screening most harmful UV, or to retain internal heat at night.

Lorna and I live with the boy about halfway up North Slope—a good spot. The crater floor behind us steepens gradually until it meets the ring of anchor pilasters which secure the roof-shield. From our front door, you can look out across Biblis Fons—still mostly raw crater floor—to the far ringwall where the manufacturing sites are located. Not much, maybe; but it's home.

I entered quietly, finding Lorna mumbling under her breath as she swept up broken glassware. The place looked . . . oh, not so bad; Biblis hadn't taken the brunt of the quake that we'd felt out in Tharsis.

"Hello, babe."

"Barney!" She dropped the glass-fiber broom and rushed to hug me. "You're home! Where were you when it happened?"

"Out in the—"

"Was anyone killed?"

"No, I—"

"Oh, why did we ever come to this godforsaken place?"

"Slow down, Lorna. Where's the boy?"

"Out playing," she said. "Mrs. Chang dismissed school after the quake."

"Uh-huh. Think I'll grab a bite, then hit the sack for a few hours. I'm bushed."

"Haven't you eaten?"

"Our meal," I said, "was rudely interrupted. Jesperson ended up wearing the salad."

She looked unhappy. "Sooner or later, that bo will get you in big trouble." Lorna did not like Jesperson. She was at the end of a rather long line.

Next morning, I was in the john, washing my hands and face—carefully, using the customary cupful of water. Lorna yelled something I couldn't quite make out. She came to the bathroom door and repeated it. "Your *friend* is on the phone."

"Jesperson?"

"None other. Say the word, and I'll tell him to get lost."

"Tell him to hang on," I said, drying myself. I poured the dirty water into the reclamation drain and went into the hall, lifting the phone. "See? Things are never as bad as they seem, eh? No permanent damage that I—"

"Worse," he said. "Things are always worse than they seem—a corollary of Murphy's Law. The still has stopped running, Barney."

That made me pause. "No water?"

"Nary a nanoliter."

Jesperson always starts with the big words when he's upset. "Um, could be the heaters are out somewhere. Coming across Tharsis, probably; or at the base of the scarp."

"That so? Use your head; the windmills were turning all along the way when we came back. And it's summer—much too warm for water to freeze and block that insulated pipe."

I found it suddenly difficult to swallow. "Sonofabitch!"

"I'm betting the trouble's up there on the volcano," he said.

"Uh-huh." I calmed down a bit. "How much in the reservoirs?"

"A few thousand gallons, give or take. Call it five E-months' supply—if we ration severely and recycle wastes."

A word scrawled on a tree trunk rocketed past my mind's eye. I mentioned it to Jesperson, expecting commiseration.

"I die hard," he said. "Get your tail over here to the hall. They've called an extraordinary council session."

"But, Jess, I . . ." He had rung off.

There were only about twenty-five Marsrats in the meeting room, but a hundred people's worth of noise and confusion. Director Scheierkopf kept trying to recognize someone; about fifteen rugged individualists were talking and shouting at once. Our new director was wearing out his gavel, while Dr. Yokomizo sat beside him, looking discouraged.

I found Jesperson slouched near the end of the third row of folding chairs. He didn't seem to notice when I took a seat beside him.

Then he sniffed, looking straight ahead. "Barney," he said in a monotone, "get Scheierkopf's attention. Make a motion that a sergeant-at-arms be appointed, then nominate that big, black buddy of yours. We don't need this free-for-all."

I must make a wonderful stooge. I stood up, holding one hand aloft. "Mr. Director!"

The Chair tried to recognize me, but couldn't make itself heard.

I put two fingers in my mouth and let out an ear-bending whistle. In the short silence afterward, I said, "Mr. Director, I move that we

elect a sergeant-at-arms to maintain order."

Jesperson bounced to his feet. "I second the motion."

The motion carried. Scheierkopf looked grateful as he asked for nominations.

I nominated Black-like-me, an oversized, sullen cat who's got to be the finest glassblower in the known universe. About two years ago, Black-like-me and Jesperson had had a tiff which was due to end in what would have been a very one-sided mismatch. I think.

Brawls are uncommon in Biblis Fons; most of the time, everyone is too tired to bother. But Black-like-me had arranged to meet Jesperson the following Sunday and, quote: Tear 'is pinhead off by th' roots, unquote. I'd visited the glassworks the following afternoon. "Listen here, blood," I'd said, "you're black, like me; but touch my friend and you and me'll tie up on the spot."

"Fight th' li'l white devil's battles for him, do ya?"

"Nope. But having him hurt wouldn't suit me. He's my pal."

"That mouthy, skinny white devil's *your* pal?"

"I like mouthy, skinny white devils," I had explained.

More bewildered than coerced, Black-like-me had agreed not to savage Jesperson. When I'd mentioned this, Jess had said, "A noble act, Barnes. You've probably saved his life."

Black-like-me enjoyed his new role. After he had been "ayed" into office, he sat in the row behind us, muttering, "I bus' a few heads, maybe."

Scheierkopf began discussing the damage suffered during the quake—mostly superficial. He seemed reluctant to bring up the topic of water.

Jesperson was patience itself. He relaxed until all of the egocentric questions regarding damage to "my" quarters and "my" breakage dwindled.

At last, he casually held up one hand.

"Er, yes, Mr. Jesperson?"

"Mr. Director, I understand that our still is no longer functioning. May I ask what's being done about it?"

"Done?" The Director's spade beard waggled; he coughed politely into his cupped hand. "This problem has just arisen and, er . . . it's impossible to make a realistic evaluation of what must be done based on such minuscule data . . ."

"Then, sir," said Jess, "I move that a crawler be dispatched at once to inspect the pipeline and windmills out through Tharsis to Olympic Base, and up the escarpment."

"Up the *cliffs?*" Scheierkopf's eyebrows rose.

"Telescopically, of course, sir. Learning as much as possible about any problem is the first step toward solving it."

"I agree completely; an excellent suggestion. Do I hear a second?" It was seconded immediately. "Mr. Jesperson," said the Director, "since you seem to be most concerned, perhaps you would be willing to undertake the inspection tour personally."

"Ordinarily, I'd be delighted, Mr. Director. But Mr. Barnes and I returned from Olympic Base just yesterday. We were, in fact, severely shaken up by the quake. We are very tired."

Scheierkopf nodded. "I see, I see. Someone else, then."

"Yes, sir," said Jesperson. "I would, however, also like to move that an action committee be appointed to research and recommend ways and means of restoring the aqueduct to usefulness."

Before I could second the motion, a baritone from the rear called, "What's the rush? Let's clean up Biblis first, then worry about the damned still."

Jess leaned backward, whispering something. Black-like-me promptly got up and stalked the loudmouthed Marsrat, telling him to either address the Chair, or get out. He was most undiplomatic about it.

Trusting Charlie that I am, I seconded the motion. After another five minutes of parliamentary manipulation, Jesperson managed to get himself elected chairman of the committee.

On the way out, a bit later, I asked Jess why he had declined the opportunity to learn the pipeline's condition first hand.

"Let someone else go," he said. "It's probably a waste of time. The break is high up on Nix Olympica."

"How can you be so sure?"

"I'm omniscient."

"Don't smartass me, old buddy."

"Go home and get your place in order," he said kindly. "Then get a good night's rest. We're going to have a strenuous day tomorrow. Meet me at North Tunnel about seven-thirty, and wear your hiking boots. We have to start getting in shape."

"Oh, yeah!" I grabbed his arm. "Jesperson, you've been scheming for years to climb that bloody, hulking volcano. Now that an excuse has come along, you're figuring to drag me with you. Well, thanks; but no thanks. Forget it. Include me *out.*"

He grinned that snide, know-it-all grin of his. "Which will it be? Would you rather sit here on your duff and snivel with the others while the reservoir runs dry, or help me save our collective tails by climbing the volcano?"

Half-heartedly, I allowed that I wasn't much of a sniveler.

"Barney, the 'if we do it' has been settled for us," he said slowly. "The 'when' and 'how' are all that remain to be decided. I've got the 'how' about three-quarters doped-out; there are some glitches, but nothing we can't solve. 'When' will

be a matter of how long it takes to convince the braintrust that there's no other way. *No* other way."

"Uh-huh, or . . . Croatoan."

"You've got it," he said. "See you at seven-thirty—sharp."

Jesperson walked away, leaving me with egg on my face and the sinking suspicion that he would always be about ten moves ahead of the rest of us.

It's still mighty cold outside that early in the morning. Wearing humidifier re-breather masks, UV cloaks and summer parkas, Jess and I climbed the northern ringwall, starting slowly, then picking up the pace bit by bit.

Jesperson is part Renaissance man, part mountain goat, and part pack mule. He lugged the eight-inch Cassegrain reflector he'd swiped from another crawler as if it were nothing. True, it does weigh only about what your lunchpail would Earthside, but the 'scope's case is bulky, cumbersome. I offered twice to spell him. He just made negative grunts and continued plodding uphill.

When we crested, an hour later, I still felt fairly strong. The wind keened and stung my cheeks; but it had warmed considerably since we started out—to maybe +20° F. Sunlight reflecting from the faceted roof-shield was blinding, making us face away. Nix Olympica's upper slopes hung above the horizon line like a still life done by some artist with a headful of acid.

Jess set up the 'scope on a hump of rock, sending me to collect a few chunks of scoria to anchor the stubby tripod legs. Taking turns, we surveyed the volcano as best we could from that distance. No more lava seemed to have issued from the east lip of the caldera, but strong billows of smoke and ash continued to cast a smoggy pall far out over Amazonis.

Jesperson tried a magnification of fifty diameters, then switched to a 70X eyepiece. He studied Nix Olympica for the best part of an hour.

On the trail down, Jess began to loosen up. Our re-breather masks and pressure suit helmets are integrally equipped with voice-actuated mikes, headphones, and a few grams of walky-talky circuitry.

"I did some homework last night in the microfile," he said. "I think we're in luck."

"Yeah, luck," I said. "All bad."

Jesperson chuckled, radiating sudden enthusiasm. There are times when he reminds me of my five-year-old. "First of all," he said, "we don't have to climb a *seventy-six-thousand*-foot volcano."

"That's a relief."

"Listen, dammit! We go up the south face of the cliffs, using the electric winches Vonex left behind. We cross-connect the heater windmills to the winch electrical system at the base—a cinch. That cuts out about sixteen thousand feet."

"Bully!" I said. "Except that those cables and winches have been freezing, thawing and corroding for almost thirty years. Even if they're still usable, it leaves around sixty thousand feet to climb, no?"

"No," he surprised me by saying. "Let's get back to that in a minute. The electrical windings on those winches are sealed, according to the specs I saw in the microfile. The cables are high tensile wire rope, designed to hoist thousands of heavy glass pipe sections. Surely they're still dependable enough to lift a few men and equipment."

I ruminated. "OK. I'll buy that, I guess."

"Now, think about your sixty thousand feet," he said.

"I am. That's *twice* the height of Everest."

"Horsepocky!" Jesperson made a disgusted snort. "Everest's summit is just shy of thirty thousand feet *above sea level;* the Himalayan plateau humps to around eighteen thou.

"Barney, Nix Olympica's collection vats are scattered down to about twelve thou below the summit, and the manifold system runs down another six–which lops off around eighteen thou, altogether. I'd say we'll have to do no more than forty-two, total."

I thought that over while we negotiated a particularly steep stretch of trail. "But, what if the break is higher?"

"Extremely unlikely," said Jesperson. "There are too many collection vats on the south slope–not to mention manifolds–for *all* to have been clobbered by the eruption. Consider this: Nix Olympica is a shield volcano; a monolith of solidified magma. Hell, as a lump, it's bigger than Phobos. It's shot with blow-holes, vents and fractures, sure; but logic says nothing much has happened to the water collection system. There's been a break, or blockage, in the main pipeline, despite the dampening struts on each support pylon. I'd bet a year's ration of wine on a break."

"Upper pipe's frozen, maybe?"

He turned to look back at me, disgust written on what I could see of his features. "Get with it! Ever see a swiftly rushing mountain stream *freeze* back on Earth? The upper pipeline is triple-insulated. Gravity keeps the water liquid; it flows too fast to freeze–molecular agitation, Barney. We don't have to use heaters until this side of the holding tanks at the base of the scarp. It's gravity feed all the way to Biblis, sure; but at a gradually decreasing grade."

"Oh. But, what if a mile or two of pipe's busted up? What the hell do we do about that? Glass is brittle stuff."

He shook his head. "The pipeline is visibly intact," he said with assurance. "I traced it downhill in the telescope all the way to the horizon line. And those pipe sec-

tions were annealed in an electric furnace; the Vonex engineers felt the same way you do about the mechanical properties of glass. But it was the only readily available building material around, without setting up a complex mining-smelting-foundry operation to work metals. Vonex wouldn't sit still for that kind of expenditure."

"Jesperson," I said, losing my cool, "do you honest-to-God believe we can hoist ourselves up the scarp, waltz forty-two thousand feet uphill in a semi-vacuum, fix the break—or breaks—and skip back down to drink hearty forever after?"

"Uh, no," he said. "I don't. That's the catch."

I sighed. "There always is a catch, isn't there?"

"Always. I haven't figured out a way to get us down again."

"I think you're crazy," I said. Some goddam catch!

I must be just as crazy. I climbed the ringwall with Jesperson for a week to "get in shape" before the council summoned the action committee to an evening session.

Director Scheierkopf attended to other business before getting around to Jesperson, which included listening to one recent arrival on Mars. The lady announced her intention to file a "damage claim" against Biblis Fons Colony, naming Vonex Corporation as co-defendant, in order to recover losses incurred in the quake.

"Madame, really; a damage claim?" The Director waggled his beard in perplexity.

Jess was mightily amused. "How Byzantine!" he muttered under his breath.

It got a sight more Byzantine the longer the lady talked. At last Scheierkopf, who can be a courtly old codger when the mood strikes him, lost his patience. "Madame, I'm sorry," he snapped. "I consider the unpleasantness recently visited upon us to be an act of God. If you wish redress, you must petition Him."

To an accompanying chorus of titters and jeers, the woman left the meeting room in a huff.

Suppressing a grin, Dr. Yokomizo leaned toward the Director, pointing out the next item on the agenda. "Ah, yes; Mr. Jesperson's report," said Scheierkopf, looking up. "Has the committee something to tell us?"

Some committee! The "committee" was Jess and me.

"Yes, sir," said Jesperson. "Shall I come up front?"

"Please do."

Jess took some notes from his coverall pocket. He went to stand beside Doc Yokomizo. "The committee's findings," he said, looking around the room, "indicate that unless something is done to restore our water supply within six E-months, every single one of us will be either dead, or dying."

Perhaps thirty-five sleepy-eyed Marsrats had attended the session. They all sat a little straighter in their chairs.

A buzz of conversation made Scheierkopf rap his gavel twice. "Come to order, please. Mr. Jesperson, I assume that you've gotten full shock value from that outrageous statement. You have most assuredly gained our complete attention. Please tell us what prompted such a declaration."

"Gladly, Mr. Director." Jess referred to his notes. "The eventuality I've described is inescapable; we *must,* I'm sure you'll all agree, have a continuing supply of potable water in order to survive. The eruption of Nix Olympica has somehow damaged the aqueduct; we know definitely that the break, or breaks, are not to be found between here and the base of the escarpment, nor in the optically inspected vertical section of pipeline.

"Ergo, we must either obtain water from other sources, repair the aqueduct, or die. Neither of the first two alternatives would seem feasible at the moment."

Again, a murmur of hushed comment traveled about the room. Yokomizo said something to the Director. Scheierkopf nodded, looking more than a little stunned. "I'm afraid I hadn't realized the extremely grave nature of our situation, Mr. Jesperson. It might be wise to contact Earth immediately and, er . . . I'm certain that a relief mission would be organized at once."

Jesperson cleared his throat. "There are only three things a relief ship could accomplish, Mr. Director. One, they could bring us a VTOL Mars-lander with which to make a very risky touch-down on the volcano's steep upper slopes—the caldera is probably a lake of molten lava just now—and attempt to repair the aqueduct. Secondly, they could rescue the colony as a whole; take us away to safety. Thirdly, they could bring us drilling equipment with which to search for subsurface ice pockets.

"Unfortunately, there are conditions and infeasibilities which preclude all three. Only two Mars-landers were ever built; one is—or was—sitting up in Nix Olympica's caldera. The second lifted the homeward-bound construction men to orbital rendezvous with the mother ship, and was then jettisoned into the sun as a menace to navigation.

"As to 'rescue'; it is an impossibility. We are all Mars-rationalized. We can never live on Earth again.

"Drilling for ice might be accomplished successfully—if we had enough time, or the mobility to search planetwide for ice deposits. We have neither."

Jesperson waited for several heartbeats during the glum silence, then turned to look down at the Director. "Sir, in your inaugural address, you described Biblis as a

self-sustaining colony. I think we must prove, once and for all, our ability to truly sustain ourselves. It's the only future we can possibly have."

Out of the subdued gathering of Marsrats, a voice called, "Why cain't they bring us watah? We got a right to live." There was a chorus of vocal agreement.

"That is an absolute impossibility," said Jesperson. "Water is heavy, bulky cargo—even frozen. It would require incredible amounts of money and effort to supply us with a bare minimum of water. Even if those resources could be found, there are times when Mars and Earth are on opposite sides of the sun, when interplanetary schedules could not be met. No, shipping water to a distant, waterless world is not possible, even as a stopgap measure."

A deathly stillness had fallen over the meeting room. I watched Jesperson gauge their mood. When the first angry grumblings began, he hit them with it, and hit them hard. It was quite a performance.

"Ladies and gentlemen, it would seem that our salvation depends upon whether or not we can equip and man an expedition to climb Nix Olympica's upper slopes."

At first there were despairing catcalls and hoots. Jesperson directed a stern look toward Black-like-me. The sergeant-at-arms rose slowly and scowled at the room as a whole. Man, that cat should patent his scowl; it would curl wallpaper. They simmered down fairly fast.

In exactly a quarter of an hour, Jesperson had them cupped in the palm of his hand. He went through the geography bit, much the same as he'd done for me, except that now his material was organized. He embellished the lecture with a blackboard sketch of the volcano.

When he finished, a few guys acted ready to grab their longjohns, pack batteries and boots, and tackle Nix Olympica there and then.

Dr. Yokomizo asked how many men Jess intended to use on the climb.

Jesperson's eyes narrowed. "Doctor, have you ever read an account of a wolf chase?"

Dr. Yokomizo allowed that he never had.

"It's interesting," said Jess. "A pack of ten or twenty timberwolves will take out after a reindeer, or whatever. One or two will run hard, harrying the stag; the rest of the pack will hang back, loping easily to conserve energy, sometimes remaining miles behind the point. When the lead wolves tire, they fall back and rest; two or three others drive hard after the animal, and so on. Eventually, the quarry either runs itself to death, or is cut down.

"I propose lifting sixteen men to the top of the escarpment. Four will carry or pull the load—some lightweight sledges might be appropriate—through the first day, ex-

erting themselves in an all-out effort while watching for the break in the pipeline. Caches of pack batteries and supplies will be dropped off at specific intervals.

"The second day, four others will work, while the first four return down the mountain, and so on. On the fourth day, if no break has yet been discovered, the remaining four will climb to the absolute limit of their strength, establish the uppermost cache of supplies, and stay overnight. Two will start downhill at first light; the other pair will take whatever patch materials they can carry and go the last leg. What I've described means climbing ten thousand feet each day, I'm afraid. But that's not an unreasonable goal now, in the summer, when we have more than fourteen hours of daylight.

"With luck, we can reach the base of the manifold system. With a bit more luck, we'll find the break much lower."

After a short pause, there was a scattering of applause; even a few cries of enthusiasm. Director Scheierkopf beamed. "Ingenious, Mr. Jesperson. There are undoubtedly many knotty problems to be overcome before the attempt is made, but it sounds a workable plan. Congratulations, sir; you have given us hope."

I collared Jesperson the minute he finished shaking hands with a gang of Marsrats who were eagerly volunteering to go with him. He had escalated himself to instant-hero in one awesome leap.

"Wonder Boy," I said, "I've a sneaky hunch who you have in mind for those last two high-climbing jokers."

He looked at me, poker-faced. "Give the gentleman a cigar!"

"Well, pardon my inquisitiveness, but does your plan now include a way to get us forty-two thousand feet *down* off that monster?"

"Sure," he said. "We'll use parachutes."

An hour later I said, "I'd rather die of thirst."

Jesperson had gone through the whole pitch: the gossamer-thin glass-cloth chute he had already designed; how Mars' slow terminal velocity would help our rate of descent; how the perpetual winds would make it a snap to get off the volcano's slopes, and on and on. And on.

"Knock off the salesmanship," I said. "What the hell do you know about designing parachutes?"

"I once did some skydiving," he said.

"And rode to Mars in a spaceship, yeah; but could you design and *build* one?"

He shrugged. "If the need arose, I suppose I'd—"

"That's crap, Jesperson! Can you walk on water, too?"

He grinned that dazzling, put-down grin of his. "Find me some, Barney. I'll give it a try."

For the next two weeks, while the water level in our reservoirs sank steadily lower, Jesperson worked us night and day. Now, twenty-five of us climbed the ringwall daily—Jess, myself, fourteen hand-picked volunteers, and nine stand-bys.

One night after dinner, Jess phoned to ask what I weighed.

"Here, on Mars?"

"Where else, for Chrissake!"

"Uh, about seventy-eight pounds," I said.

"You're fat." He hung up before I could pry an explanation out of him. Fat, he calls me! I'm skin and bones; I once tipped the scale at two-thirty, Earthside.

Next day, climbing the ringwall, Jess packed a bundle; two Marsrats behind him carried an empty glass box. He led us west along the ringwall's rim until he found a spot he liked—a block of ejecta that never quite got ejected, with a sheer drop of maybe seventy feet on the other side. I'd twigged, by then, of course; he was going to test his homemade parachute.

Two guys set down the empty glass box; the rest of us scrounged rocks and pebbles and began to load it. When it was all but full, we closed the lid, tipped it on end, and shoved it to the brink of the precipice.

Jesperson attached his parachute to some eyelets high on the box's sides. He stood back. "There; that's you, Barney."

"I'm going to take the fall?"

"Right."

"How, pray, are we to recover me?"

He tapped a bulge in the chute with his gloved index finger. "Transponder. Vic Gonzalez jiggered it up for me. Vic's out there now." Jess pointed.

Sure enough, a crawler was sitting about five miles to the northwest, on the fringe of Mesogaea.

"Here goes," said Jess. "Stand back; it might swing sideways when the chute pops."

The wind wasn't too strong—no more than eighty knots, I'd judge. Jesperson looped a length of glass rope through the chute's D-ring and tied it. He looked left and right to make sure everyone was clear, then stepped back and jerked the lanyard.

The pack came open leisurely; then a small bottle charged with compressed CO_2 ballooned the parachute with an audible *whoup!* The glass box was gone.

The chute was a wide, shallow-dished, translucent half-bubble that looked like an airborne Portuguese man-of-war. Its rate of descent was not very sharp, nor did it oscillate much in the wind. Jesperson called it a "ring-sail" adaptation, featuring an annular opening near the perimeter, as well as the center vent.

We watched it drift like a thistle out toward Mesogaea. It went a good bit farther than Gonzalez had

anticipated. The crawler turned and chased it practically out of sight.

On the trail down, I asked Jess whether we might not drift halfway around Mars from high on Nix Olympica.

"Not to worry," he said. "I'll teach you a trick—how to spill air with your risers and sharpen the rate of descent. There are worse things than that to worry about."

"Such as? I'll get busy worrying."

"Freezing is by far the worst danger," he said. "Staying out in the open night after night will put a tremendous strain on our pack batteries. But, we've no choice."

"Uh-huh. What else?"

"Sandstorm," he said. "Wind velocities of three hundred knots are common during big storms. And we'll be climbing the windward slopes. A major storm could screw up the climb but good. Unfortunately, the season's just beginning."

"Cheerful thought." I got the impression that he was leaving out one or two minor items.

"Forget all that bad jazz," said Jesperson. "If the weather holds, we go next week."

We lost a man before we even got started—a lousy omen.

Two crawlers crammed with water, food, pack batteries, spare boots and so forth, had gone ahead a couple of days before we were due to leave. The Marsrats beavered most of the payload, and both of the spindly sledges that had been arc-welded together from bits of handrail stripped from the crawlers, to the top of the scarp without incident. The lift goes up the cliffs in five steps, with a platform and a seventy-foot boom to allow for the setback at each level. A slack cable hoist is unsafe on Mars; operating on a long moment arm, the mild force of the wind would tend to warp the payload into the cliff face. As the topside winch drives the takeup reel, a drag spindle keeps the cable taut from below. Each step lifts you about three thousand feet.

One of the Marsrats had leaned out too far when hustling a netful of gear onto the platform. He had lost his footing. They never recovered the body.

We spent the last night crowded into Olympic Base's two smallish rooms. Doc Yokomizo checked over each of the sixteen climbers, pronounced us fit, and turned us over to Jesperson. Jess made his lecture short; he stressed one directive, repeating it twice for emphasis: we were to stay alongside or beneath the pipeline at all times. *Always.* Vonex engineers had surveyed the southern slopes exhaustively; though the going might look awful ahead, he assured us that the pipeline took the best and safest route. Besides, we had to maintain a sharp watch for the break.

Yokomizo gave us each a sleepy pill shortly after sundown. Next

thing I remember, Jesperson was shaking my shoulder. "Up and at 'em, Barney." We ate a more-than-hearty breakfast, shook hands all around, and suited-up.

We went up in the dark, with that day's four sledge men riding the first net. Black-like-me was one of them. It was -74° F, and windy—a nice summer night.

Later, I was glad of the dark. Thoughts of being hoisted three thousand vertical feet at a crack in an open-weave cargo net are bad enough without being forced to look down and see what isn't underneath you. I recall watching Phobos roll by, a sweeping arclight among the unwinking stars, and praying that my pack batteries would continue to hang in there. The wind sang in the rigging; no one said much of anything.

The spooky part is when you end up dangling seventy feet away from the platform's lights like a spider on a string, an arm lowers from the boom to grab the cable, and they warp you in. That part is *nasty.*

As we ascended the last leg, it was beginning to get light enough to see below. I was sorry; looking down makes you want to vomit. To me, it seemed we had already reached the summit of Mars.

The uppermost platform lies about three hundred feet below the curling lava lip at the brink of the scarp. You climb in a narrow canyon—a cleft in the lava flow—and the pipeline climbs beside you, rising quite steeply near the top. It was a weird procession. A Marsrat wearing a partially distended pressure suit, with the monk's cowl of his UV cloak tied around his bubble headpiece and the skirts of his cloak flapping around his boots, makes quite an apparition. We looked like teddy bears on our way to church.

We had to lower our visor-filters when the sun hit us. It made the going tougher, what with deep shadows everywhere underfoot. When we crested, I scrambled away from the edge quickly. Above us, the first sun bathed the gray-black slopes. The view was about what a gnat would see if he lacked the sense to climb a huge, slate-colored iceberg.

We started trekking uphill without fanfare; Jesperson allowed no pause, swinging an arm to wave us on. Black-like-me, his mates and their sledges, were already a cluster of dots a mile or two above us.

Gigantic bulges of viscous, slow-moving lava had congealed on the lower slopes. This layering isn't pitched very sharply—maybe a thirty percent grade. But I began to appreciate that forty-two thousand vertical feet meant seventy, eighty or more miles of lateral travel.

The morning went by swiftly. I sipped intermittently from the water and liquefied food tubes, fell into a steady rhythm and began to swing along easily. We hit the first

abrupt rise in late forenoon, a point where gluey lava had hardened into a tumbled, thousand-foot massif. The pipeline pitched up with it; we climbed alongside the pipe, laboring a bit now. The surface was better than I'd expected; the southern slopes had been sandblasted over the eons to a pitted, grainy texture. Raw lava would have cut our boots to ribbons during the first ten miles, so this was a blessing.

Talking about climbing Nix Olympica is one thing; actually doing it is a different program. It's an exercise in endurance and agility. Mostly endurance.

The lead team failed to stop at dusk. Seeing the way ahead to be clear of obstructions, they pulled their sledges another mile or so uphill by starlight, then collapsed from exhaustion. We marched on and caught up with them quickly.

Jesperson allowed an electric lantern to drain the single fuel cell we carried long enough for us to close the valves, decouple our body waste bladders, and slip in fresh ones. Likewise for liquefied food and water bladders. It was a hasty operation.

Everyone was too tired for much conversation. Jess went around, warning us to make certain we plugged-in fresh pack batteries for the nine-plus hours of extreme cold and darkness. When he got to me, he motioned for me to switch off my radio and touched helmets. "How goes, Barney?"

"It was fun."

"Yeah? Well, it'll be more fun tomorrow. Remember: you and I are scheduled for the main event. Pace yourself; save something for the stretch drive."

"Will do," I said. "How much ground did we cover?"

"Not all that much, dammit," he said. "I estimate that we're about nine thou above the lip of the scarp. Maybe a little less. I expected better; we were fresh today. Tomorrow, everyone will be stiff and sore. Get as much sleep as you can, and mind the pack batteries."

"Check."

I watched him move on to bend over Black-like-me, then the next man. Pretty soon, the light went out. We were alone with the wind and the stars. And our thoughts.

It's awfully lonely, lying there on hard lava, with your UV cloak wrapped under you to protect the flimsy pressure suit from puncture. Our suits were ballooning quite a bit now; down on the desert floor, there is less than two percent of the "air" Earth luxuriates in at sea level. Up where we were, it gets mighty thin. I had unslung the CO_2 bottles and laid them beside me. I cranked the feed down a little, watching Phobos sail by. One advantage of being a CO_2-breather is that in an emergency you can live for quite some time on your own exhalation before the waste prod-

ucts build up to toxic proportions. I decided to watch Phobos crawl all the way to the horizon . . .

Jesperson was pulling my arm. The light on the sledge was glowing; I could see Jess' grim mouth under the helmet's bubble. A thin gray wash had been borne along the eastern horizon, and a cluster of Marsrats was silhouetted against it; they were kneeling and standing around a prone figure.

During the night, Black-like-me had frozen to death. Scowling. He had either been too spent to charge his pack batteries despite Jesperson's admonition, or the batteries had failed. The black population of Mars was thereby reduced by about ten percent.

We had to leave him there. There was no choice, but it hurt. His three companions spent a moment encouraging the rest of us, then waved and headed back down the volcano's gray-black flank toward home.

The second day was dull, plodding misery. We went up and up; the shield layer's sand-smoothed surface was like a tilted dinner plate, rising forever into the black sky.

We overran the sledge-haulers in late afternoon. Ahead of us, a broken, fissured wall formed by a bulging bedding plane of lava jumped up several thousand feet. The sledge teams began climbing one behind the other, having a bitch of a time negotiating bends. Worse, terrain surfaces in the canyon had been protected somewhat from windblown sand. Sharp corners began to shred our boots.

The sledge teams slowed to a crawl, setting their feet down with extra care; a fall there in the canyon would have meant writing someone off.

At first, Jesperson waved us back when we tried to help the sledge guys. He was thinking about conserving our strength for tomorrow and the day following. As the westering sun neared the horizon, he changed his mind. Had darkness overtaken us there in the ravine, it would have meant a tough, uncomfortable night. The eight of us who were climbing unburdened took turns boosting the sledges from behind.

We went over the top as the sun dropped into Amazonis. Dark falls on Mars with unbelievable swiftness, like a cloak being drawn over a lantern. We changed food, water and waste bladders by the glow of the fuel cell light, but this time Jesperson went around and personally plugged-in fresh pack batteries for everyone. When he touched helmets with me, I said. "How'd we do?"

"Lousy. Not more than seven thou. Get some rest."

I did, believe it or not—flaked out on a stony bed of lava, with a howling ghost wind stirring the

flaps of my UV cloak. That's how tired you can get.

At earliest light, we waved to the four lucky cats who were homeward bound, turned and plodded uphill, up the endless flank of that never-to-be-sufficiently-damned volcano.

The going wasn't too terrible in the morning, but I was dragging tail when we halted at noontime. I decided to change my lacerated boots then, when it was warmest. Earlier or later in the day, disconnecting your boot heater plugs invites frostbite.

The afternoon was a hypnotic monotony of fatigue and bleak lava; lava and fatigue. Jesperson drove us hard.

That evening, the self-encouraging chatter on the intercom system petered out rapidly. Jesperson flashed a weary grin, not bothering to keep our conversation private. "An honest ten thou today," he said. "We'll get there."

We went through the bladder-change ritual, ate, slept fitfully, bade good-bye to the descending foursome, and got into the sledge harnesses. I quickly found out what a piece of cake those first three days had been.

The crude sledge runners crimped and hung up on every rough edge of lava. And the sledge tended to yaw away from you; two guys can never pull with equal force. There was a sort of horse-collar, too, which we threw over our shoulders to cut down chafe after hours of tugging the glass-fiber rope. I suppose it helped.

By late afternoon I was semi-conscious, going on willpower alone, when my partner passed out. He slumped forward to his knees, then sagged on his face. He rolled downhill several yards before I could drop the tow rope and grab him.

I checked his CO_2 bottles; the feed was normal. Jess and his partner, who had been following us, came up quickly. My partner was unconscious for about ten minutes. I could see Jesperson's worried squint dimly through the filter-lens of his fishbowl.

The Marsrat came around, acting pretty game about going on. He seemed OK for a while, but a quarter-mile farther on he staggered and dropped to his knees.

Jess talked briefly with his partner, then came over to me. "He's through, Barney. Saddle up; we go it alone from here."

"Right," I said, but didn't really mean it.

"I want to get to the top of 'that' before sundown." Jesperson raised his gauntlet. "That" was a huge, tumbled battlement of lava. The pipeline snaked into a canyon and disappeared. I couldn't see the top of the blasted thing, it was that huge.

I followed Jess' example, unzipping my UV cloak. I shrugged it off. We strapped parachutes low on

our backs, chest-slung the CO_2 bottles, and struggled back into the cloaks. The other men unshipped the prepared back packs from the sledges and helped us seat them high on our shoulders, resting on the chute pack bulges and bouncing a bit when we walked. It was an ungainly arrangement; balancing yourself on a steep climb would become a helluva problem.

We were ready to travel. My partner tried to make a thumbs-up gesture with the mitten of his p-suit. I clapped his headpiece to make him feel he hadn't let us down, grabbed the other Marsrat's gauntlet briefly, and hurried after Jesperson.

In five minutes, we were all by ourselves—Jess, me, and Nix Olympica.

Getting rid of that sledge made me feel spry for a short while. We covered some ground, going up that cliff one-two-three. But we failed to make the top before darkness closed in with a rush.

It was a rotten night, spent in an alcove in the canyon wall that we found before it got completely dark. We took turns digging into each other's packs for supplies. I managed to change batteries in the dark with no hitches, but the bladder ritual almost did me in. At the last instant, I caught myself in the act of turning a valve the wrong way. You can't imagine how inutterably weary, stiff-muscled and discouraged you have to be to do that. It would have meant explosive decompression, and bye-bye Barney.

We more or less leaned against the rock wall through that awful night. Tired as I was, I never managed more than a fitful doze.

Morning found us groggy, but determined—me groggy, Jess determined. He roped us together, banged me once on the helmet in lieu of a pep talk, and we took off.

We climbed for an hour—tough going up a very steep cliff face. Jesperson was about ten feet ahead, and six feet above me, when he fell. By now second nature, I'd been scanning the pipe for signs of the break; he put his weight on his right foot and his feet went right out from under him. He landed sideways, on his butt, clawing for a purchase with both hands. The back pack overbalanced him; he came down on me.

If I had turned even a little bit, we would have spun together and gone down and down, caroming from shelf to shelf to splatter on the lava bed about two thousand feet below. I flexed my knees and caught Jess around the waist, but his pack was jammed into my visor, forcing my head back. We almost went over backward.

It was a near thing. My heart drummed paradiddles and my knees went soft. Then I noticed Jesperson's excitement. He pushed his helmet against mine aggres-

sively. "Ice!" he yelled. "I slipped on ice."

We clambered downward a dozen yards to a spot where two men could stand, took crampons and ice axes from each other's packs, and strapped on the crampons. Now Jess knew what to expect. But ice still makes for tricky going on a steep cliffside.

Jesperson waved an arm, pointing. A miniature glacier peeked over the brow of the cliff on our left. Ten minutes later, we scrambled over the lip and beheld the most disappointing sight I have ever seen, or hope to see.

Not frozen wash from a break in the pipeline, the ice fall was the product of a volcanic vent such as those feeding the collection vats higher up the mountain. A frozen Niagara cascaded downhill in a widening fan of ice.

Jess said, "All in the game, Barney. But we're getting close; I can smell it. Let's hike."

And, as God is my witness, we hiked, removing the crampons after crossing the ice fan. Then we climbed and hiked and climbed some more to a layer of lava flow which pitched up discernibly sharper than any we had previously encountered. We trudged up the forty-five-degree incline for hours, keeping the pipeline to our left, the wind to our right. In early afternoon, Jess called a halt. I collapsed against a large boulder.

I began to notice the wind for the first time. Strange, but its howl had risen in pitch; it exerted force that you could feel as you walked. I mentioned this to Jesperson. He nodded, saying nothing. Had I had the strength left to enjoy it, I would have thought the view spectacular. Biblis Fons was a bright dimple marring the ocher plain of Tharsis, seemingly a stone's throw beyond the brow of lava. Way off to the southeast, toward the canyonlands, the summit of North Spot, the second largest volcano on Mars, peeked over the horizon.

We used the last of the food, water and waste bladders. With luck, there were enough pack batteries to last the night and a bit of tomorrow, no more.

Despair was setting in. Neither of us wanted to admit it, though we were both thinking it, I'm sure. Nix Olympica had won; the dice had rolled, coming up snake eyes; the mongoose had whipped the cobra one more time.

I shielded my eyes against the sun and looked out over Amazonis. Somewhere far out there, in the lee of the winds whirling around this great, black monolith we were sitting on, were three invisible dots. The crawlers were to have stationed themselves at fifty-kilometer intervals; the two-man crews would be listening at their receivers, hoping to hear the bleep-bleep of our chute transponders as we were yanked from the unforgiving flank of Nix Olympica.

Our friends would wait in vain. I knew that as long as he could crawl, Jesperson's demons would drive him upward, up the volcano's endless slopes. Failure was a word Jesperson had never learned; it was simply not a part of his nature.

And I knew I'd be right behind him, staggering up through that devastation of ropy lava flow, with the gray-black shoulder of the upper heights forever looming against a black sky.

Jess had been studying the terrain ahead. "See this stuff above us, Barney. What's it remind you of?"

I shrugged. "Hell. The geographical center of Hell."

"Wrong," he said. "Some of those boulders, like the one you're leaning against, look just like the blocks of ejecta around Biblis. See them?"

"And?"

"That's not the edge of another layer; I think it's the tilted ringwall of the large crater I pointed out to you in the photos. Remember?"

"Uh-huh. So what?"

"So the crater's only about fifteen miles across. A few thousand feet above the far side is the manifold outfall."

I perked up. "You mean we're almost there?"

"That's what I mean."

"Jess, you wouldn't feed me a ration of crap just to egg me on, would you?"

"Certainly I would, Barney. But I don't have to; it's the straight skinny."

"Really?"

"Really. Come on; let's hike."

We climbed through the afternoon underneath the pipeline until it disappeared through a notch in the broken lava near the top of the rise. The footing was treacherous on that stretch. I began to think that Jess knew what he was talking about; chunks of scoria and jagged boulders were everywhere. Brick-sized rock rolled under your boots if you were careless about where you stepped.

The damned wind had teeth in it now, making it more and more difficult to keep your balance. It was a new experience; except during sandstorms, I had never before felt the Martian wind as a tangible force. I suppose I was too tired to appreciate what was going on at the time. But Jesperson knew.

Jesperson reached the crest ahead of me. He spun around clumsily, shoving up the visor-filter of his fishbowl, and did a kind of jig. He was grinning like a cheerful skull.

My heart fluttered once and rose into my throat. I clawed my way upward and crawled to the top.

My heart plummeted right back down into my boots. The break was a dozen yards away, with nothing but fifty feet of moaning wind beneath it. We couldn't get near it.

In some bygone age, a meteor had smashed into Nix Olympica's

nose, leaving a jagged-walled crater floor that tilted sharply upward with the terrain. The pipeline emerged from the ringwall just beneath us, jogged up at perhaps ten degrees for a dozen yards, then pitched upward precipitously to follow the contour of the crater floor, supported by a series of spindly pylons at fifty-foot intervals.

Just beyond the knee, a lower chunk of pipe coupling had let go. The eruption probably swayed the relatively unsupported section too far laterally; the fractured section swung gently in the wind, dangling by three thicknesses of unbroken insulating material. Beneath the break, a stalactite of frozen water had all but joined a huge stalagmite of ice rising from the crater's inner wall.

I turned toward Jesperson in dismay. He was busy shucking off his back pack and CO_2 bottles. As I watched, he unzipped his UV cloak and shrugged out of it, setting three or four rocks on it. In his raw pressure suit, he looked naked.

I said, "What do you think you're doing?"

"Getting set to tackle the damned pipe. What did you think?"

"How?"

"I'll show you."

"Jess," I said, "you'd better wait until morning. Only about two hours of daylight are left."

"We can't wait, Barney." He gestured. "Look down toward North Spot."

I turned. And almost fell down. I actually had to lean into the keening wind. Long, reddish-brown tongues were licking swatches from the far-off desert floor. The northern horizon was obscured by a murky brown overcast.

"Sandstorm!" I yelled. "Why didn't you tell me?"

"Extra worries never helped anyone," he said. "But, we've got a problem. Watch." He scraped a handful of dust from the lee side of a rock, holding it aloft. The wind snatched it from his gauntlet immediately. "Two hundred and fifty knots, maybe more," he said. "It's got to be now or never, Barney."

I looked at the pipe, hanging above the windblown gulf, and swallowed with difficulty. "You're thinking to crawl out *there* and fix the break?"

"How else?"

"Want me to go?" I heard myself say.

"You've got four thumbs," he said, grinning. "Don't be silly."

"But . . . God! It's chancy, Jess; if there's any moisture clinging to that pipe, you'll freeze your suit to it and stay there forever. And the wind . . . If you fall, it's . . ."

"On Mars," he said, "every drop of water that doesn't freeze, evaporates. I'll watch it; I think we can beat the wind. It isn't *that* strong."

He looped the twenty-foot length

of line we'd used to rope ourselves together around his waist, then tied it loosely. He slid an ice ax into his belt holster, plugged both patch kit heater elements into his pack battery outlets, then slung the bulky kits on either side of his belt.

He had me tie the length of light line to his belt padeye, wound it twice around his torso, then once around his neck dam, handing me the coil.

"Get windward, down the slope, and guy me as I go out. Don't pull; just keep the line taut. Can do?"

"You betcha!"

He took a whiff of CO_2 by snapping the bayonet fitting of his air hose into the bottle's socket, disconnected, and gingerly climbed down to straddle the two-foot-diameter pipe.

I slowly picked my way down the inner slope, paying out line until I reached a good spot to stand, then pulled the line taut.

Jesperson began shinnying out along the pipe, sitting torso-erect to let the guy line take the strain caused by wind pressure on his p-suit.

I tried to stay abreast of him, but the ground fell away too steeply and ruggedly. I had to be doubly careful not to stumble; Jesperson would have had difficulty keeping his balance without the guy rope.

He reached the knee just this side of the break. I was still upwind of him, but quartering—not the spot I would have chosen. Jess didn't like it either. He leaned forward, supporting himself with his hands, crossed his booted feet under the pipe, and laid his fishbowl against its curved upper surface. With one hand, he made a choppy downhill gesture, then clutched the pipe again. Not letting the line go entirely slack, I picked my way down through the jumbled mess until I was directly upwind of Jesperson. I gave two light jerks on the line, then held it firm.

He went to work. Knees still locked around the pipe, he slowly drew out the ice ax, looped the thong around his right gauntlet, and began chipping away at the large icicle hanging from the break.

Jess worked steadily, carefully. When most of the ice was gone from one side, he switched hands and chipped at the other.

I won't soon forget the picture Jesperson made, silhouetted by the lowering sun, straddling a slick, black glass pipe in a hurricane that was blowing ten miles high across the biggest damned volcanic pile in the Solar System, while showers of ice crystals flew away from his ax.

He chopped a concave hole in the break itself; from below I could see the cavity better than he could. Then, lying flat once again, he used the tip of the ax to scour the inner lip of the fixed coupling section. He returned the ax to his belt, reached around with both

hands and felt underneath to make sure that the lower lip, where the broken coupling had nested, was free of ice.

He inched forward two feet and untied the line he had wound around his waist, passing one end under the pipe. The wind obliged, blowing the free end over to where he could grasp it with his other hand. He straightened, tying a thick-fingered loop around the fixed line.

Jess fiddled with it, shinnying backward, finally managing to get the loose, flapping loop under the forward end of the dangling coupling section. He pulled upward; the broken section rose almost enough to close the gap. Jess tugged harder. Each time he pulled, the gap narrowed. Eventually, it closed.

He tied the line off, backed up about two feet, and opened the patch kit slung from his left side. The foot-wide glasscloth roll came wound around a spindle. Jess kept the flap short, holding the spindle against the pipe with one hand; with his other, he opened the warmed patch pot and daubed a brushful of gunk—some kind of special, quick-curing epoxy, I think—over the end of the glasscloth roll to start it. He stuck the brush back in the pot and snapped down the cover.

The epoxy air-cured in no time in that wind; he started winding a shroud of glasscloth around the break. It was slow work; my arms were aching badly from holding the line taut, but Jesperson's arms must have felt like they were falling off. I was prepared to die cheerfully before letting go of that line.

It was the coolest, most methodical piece of work I've ever seen a man perform. Jess got the roped pipe wound tightly, ending on the far side of the break. Then he inched backward, gunking the shroud liberally, top, bottom and sides. He did it quickly, neatly, as if he were sitting at a work bench in Biblis Fons.

Then he surprised me. Before the near end set, he let the wind have the first patch kit entire, and started the second roll of glasscloth. Typical Jesperson! If he did it at all, he would by God do it right!

Fifteen arm-aching minutes later, he was done. He came inching backward while I climbed slowly to stay windward of him. When Jess got to the ringwall, he relaxed, slumping against the rocks in exhaustion.

I scrambled up, wanting to hug the beautiful bastard. Instead, I helped get him into his chute. The sun had fallen behind the crater's ringwall; darkness was one scant hour away.

I said, "You looked *real* good out there."

He nodded wearily. "Tomorrow's sun should melt the ice block inside the pipe."

"Sure," I said. "They'll be drinking the snow of Olympus tomorrow in Biblis. Let's get the hell out of here."

"Great idea, Barney. By rights, we should trek around the shoulder of the volcano a ways to quarter the wind. But, there's no time. If we wait till morning, there's the sandstorm and . . . who knows?"

"I'll follow you, Jess. Whatever you say."

"Then we might as well chance it from right here," he said. "Remember, once you clear the badlands at the base and want to spill air with your risers, be careful not to collapse the chute."

"Can do. I hope those guys are waiting out there."

"They'll be waiting," he said.

I took off my UV cloak and doffed the CO_2 bottles. We fought the wind along the crater's rim to a spot Jesperson thought might do. We faced each other, the wind screaming around us. Then, without ceremony, Jesperson stuck his mittened hand through the chute's D-ring and tugged.

I was right behind him.

After the rirst rude jolt that made my testes ache, it was like the dreams of flying we've all had. Jesperson and I were borne across the lava bed beyond the crater at a helluva clip.

But something was wrong; we weren't dropping, but *rising.*

The lava bed fell away beneath us. Just beyond it appeared a cleft perhaps ten miles across. Three-hundred-knot winds, laden with floury dust from the plains far below, were being channeled up that gigantic canyon like a flume. The roaring river of air carried us along like a pair of thistles in a wind tunnel. We were borne higher and higher.

And higher! I couldn't see Jess' chute; he was above and slightly to the right of me. When I looked ahead, I got scared in a distant, second-handed way, as if it were happening to someone else. We were being swept directly toward the looming massif of Nix Olympica's summit at phenomenal speed. Some justice!

Suddenly, it was like being in an express elevator. I felt my stomach churn. We were carried up and up. Tired as I was, I nearly flipped at the sight.

For an instant, we were higher than the summit of Nix Olympica. I was looking down into the angry red throat of Mars himself—a seething cauldron of magma that had boiled up from the planet's bowels, filling the immense caldera from rim to rim.

The wind blew us away to the northwest, under the hundred-mile streamer of windblown water ice that had given the volcano its name.

When we were clear of the badlands, I grabbed the windward ri-

sers and spilled air, dropping fast, following Jesperson's floating chute down toward the floor of Amazonis.

I was dragged a thousand yards or so before I could catch the whipping risers and dump air. I banged my shoulder, cracked my fishbowl, almost had one leg torn off on a boulder, and lost some meat from both forearms before I got loose. I was too tired and beat up to move for a few minutes after that.

The sandstorm was picking up steam; windblown sand made the setting sun a bit of orange fuzz to the west. But you could still see, more or less, for about thirty yards. I limped downwind, searching for Jess. I'd seen his chute disappear into the reddish-brown murk just ahead of me as we came down. He couldn't be too much farther ahead.

In the failing light, I came upon some drag marks that were rapidly abrading as the sand blew away. I followed the furrows for a hundred yards, then whooped and charged toward Jesperson.

And stopped. His chute was billowing behind him like a spinnaker sail, weaving and jibbing in the gale. He was wedged between two thrusts of a small rock outcropping, not moving.

I put my back into it, hauling on the lower risers to spill air. I tore open his chest latch, eased off the harness, and let the parachute blow away.

I was on my hands and knees, trying to figure out what the trouble was, when a crawler rolled to a stop beside us. Vic Gonzalez and Dr. Yokomizo jumped down, leaning into the wind. Both wore sand masks and goggles.

Jesperson's back was broken.

Yokie injected morphine from the crawler's first aid kit. Then Victor and I broke out the litter and, handling Jess like a crate of eggs, put him aboard the crawler. After I took off my helmet, I told Gonzalez that if he bounced Jess around even once on the way back, I would feed him his own *cojones.* The crawler rocked gently in the wind as it circled to head back toward Biblis Fons, then found what was left of its own ruts and churned along smoothly.

Yokie wouldn't say much. He wanted to get Jess on the X-ray table, then consult with Dr. Klein, who's had neurosurgical experience. But he didn't appear overly hopeful.

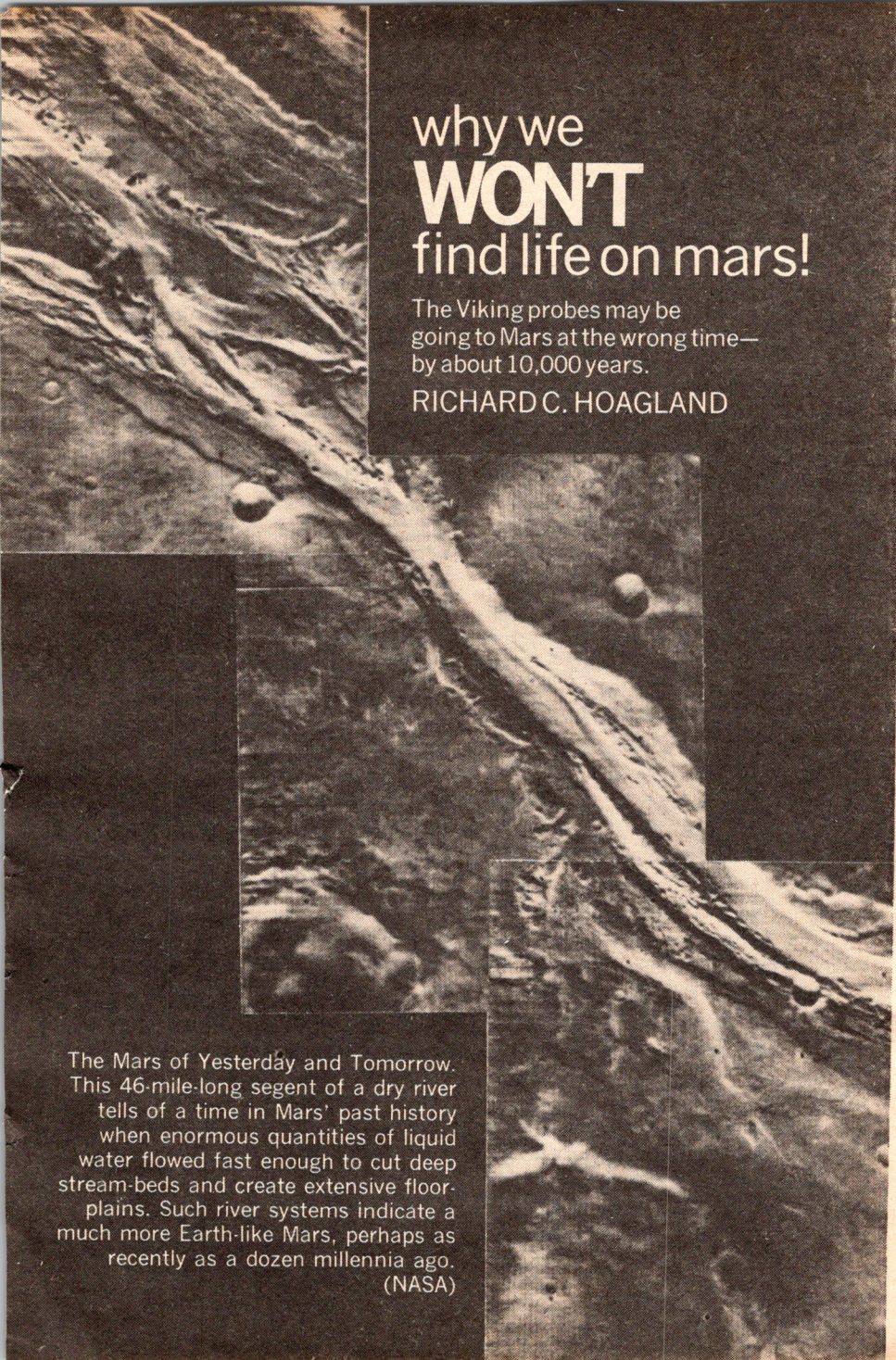
Jess opened his eyes, later. He tried to grin at me. His lips moved; I had to bend way down to catch what he said.

"We . . . climbed ol' Nix."

"We climbed the mother," I said. "Rest now. Just rest."

He's going to make it. I know he's going to make it. Jesperson is a tough monkey.

He's got to be. He's a Martian. ■



why we **WON'T** find life on mars!

The Viking probes may be going to Mars at the wrong time—by about 10,000 years.

RICHARD C. HOAGLAND

The Mars of Yesterday and Tomorrow. This 46-mile-long segent of a dry river tells of a time in Mars' past history when enormous quantities of liquid water flowed fast enough to cut deep stream-beds and create extensive floor-plains. Such river systems indicate a much more Earth-like Mars, perhaps as recently as a dozen millennia ago. (NASA)

The Viking exploration of this new world had been going badly. The site of the original landing appeared at first ideal: a low, sandy locale protected from the winds, on the edge of the polar cap but far enough south for daytime temperatures to rise well above the freezing point of water.

The objective: to determine if this new world was habitable and/or inhabited. The Viking team, in addition to this prime observation, also sought to carry out several subsidiary determinations, among them a detailed mapping of the landing site, assay of mineral and chemical resources, and suitability of the site as a permanent settlement for future missions and more extensive exploration.

In the probe for indigenous lifeforms, the Viking Project met with almost immediate success. The range of fauna and flora astounded those who had planned the mission, and data relayed back made it apparent that the diversity of ecology equaled, if not surpassed, anything humanity was familiar with at home. The remote exploration proceeded, the equipment exceeding its original design specs as new discoveries continued to be made.

Then trouble began.

The Viking team noticed it as an increasing resistance of certain local organisms to the presence of the craft which had come so far to investigate this semifrozen world. Day by day this hostility increased, until, with key samplers destroyed and with the ultimate failure of the mission inevitable, the mission directors decided to withdraw. The Viking Project, pending possible future reassessment of the dangers, was terminated, the brief interest in this world dying like the scattered scraps of advanced technology left so far from home amid the drifting sands and polar winds—left to the rightful inhabitants of *North America* for almost another half millennium!

Thus ended the first Viking expedition. The Norsemen (my ancestors!), repeatedly assaulted and decimated by Indians, returned to Greenland, abandoning their brief experiment on the new continent. Little could they dream that, centuries later, others—better equipped both politically and technologically—would succeed where they had failed. Their retreat, partially because more immediate riches were available through raiding the already developed European continent, abandoned perhaps the richest developmental prize in the history of the human race. It is ironic, therefore, that from the unique environmental wealth of North America should follow a *second* Viking experiment.

It is by virtue of the untapped abundance, area, and isolation of North America that such an entity as the United States could grow, relatively undisturbed, to become

the technical and social leader of the planet. It is no accident that it is this nation, dominating North America, which has sent explorers to another world, or that it is about to send electronic surrogates under the code name *Viking* to Mars. And therein lies the deepest irony.

This new Viking Project, unlike its predecessor, will fail not through discovery of life indigenous to its destination, but through the *lack* of such evidence. If Viking does not detect life in some form or, at least, strong evidence of organic molecular structures on Mars, then public interest in continued exploration not only of Mars but of all space will plummet. Who will want to waste badly needed money exploring a dead Solar System?

And thus, like its historic precedent, another Viking Project will have occasioned the abandonment of a new world. The result of this tendency toward historical repetition, however, may not follow the script beyond this traumatic withdrawal. There are those who feel that exploration and development of the Solar System may be, in its ultimate form, a kind of social "safety valve." That, without access to the immense new resources and technologies of space, life on Earth at this critical juncture can only turn in one direction—downward—as nations and people fight to monopolize dwindling resources amid rising populations. At best, repressive measures limiting population growth, consumption, and surplus activities will not leave sufficient resources for a second look at Mars, perhaps when future interest quickens. At worst, the abandonment of the resources of the Solar System can mean increasing conflict between the have and have-not nations of Earth, conflict ending in nuclear war and the destruction of all life on Earth.

In this light, with not only future exploration of Mars and the Solar System hanging in the balance, but the very continuance of life on our planet perhaps dependent upon the results of Viking's discoveries on Mars, why is the vital mission doomed to failure? And, while we're asking interesting questions: How did we ever get ourselves into this particular box? And a final one: Is there a way out?

Let us begin with question number two.

We have been brainwashed. The year following the planned Viking landing on Mars (1977) will mark the Hundredth Anniversary of the "birth" of the canals. It was during a particularly close opposition, late in the summer of 1877, that Giovanni Schiaparelli, from the Observatory in Milan, noticed markings on the large disc of Mars which he called *canali,* meaning "channels." Through faulty translation and a predisposition to ,belief in an inhabited Mars, even then, his *canali* became "canals."

And everyone knows you don't get canals without canal-diggers—ergo: Mars must be peopled by somebody with a penchant for excavating a great quantity of Martian dirt.

But it was an American (who else?) with a natural talent for Madison Avenue tactics, Percival Lowell, who really sold Americans (and anyone else who'd listen) on the idea that there were Martians busily operating power machinery all over the Martian surface, frantically canaling water (a *very* scarce commodity on Mars) from the polar caps to wherever it was needed more. Lowell, who erected an observatory in Arizona solely to study the planet, built up an elaborate romantic picture of struggling Martians coping with the inexorable desiccation of their dying planet, uniting in the face of planetwide disaster and pooling social and technical talent toward one objective—survival.

Throughout this last century there have been diverse and fascinating indications of how deep in our society the idea of Mars as an abode of life has been ingrained. At various times prizes have been offered for detection of life outside Earth—with Mars *excluded* as being *too easy* a target. Serious communications have been proposed with Martians, some involving such gargantuan schemes as bulldozing a huge right triangle in the Sahara Desert to illustrate the Pythagorean Theorem. It was to have been filled with oil and lighted at night, thus conveying to the Martians that not only could we move a lot of sand, but we understood geometry *and* had discovered fire!

Most fascinating was the order given by both the Chief of Naval Operations and the Director of the US Army Signal Corps to maintain radio silence during the Mars opposition of 1924, in order that radio communication from the Martians could be clearly heard. The Army even had its chief cryptographer, William Friedman, standing by, just in case. As history now shows, Mr. Friedman did not achieve immortality through deciphering a message from Mars, but did achieve notoriety later, during World War Two, by cracking the Japanese code.

Oddly enough, during this period, with Lowell drawing vociferous attention to Mars (and indirectly to the other planets which had been largely ignored by astronomers), said astronomers were piecing together a Martian environment decidedly *unhealthy* to such living organisms as they were familiar with. This increasing disparity between the romance of Mars and the reality of Mars seems to have gone largely unnoticed by the public. The blame for this schizophrenic attitude can probably be laid to the rise of a new literary art form: science fiction.

It has long been lamented by

some people (mainly SF writers) that the "literature" is largely ignored by the general public. I believe this is inaccurate. Backed by a cover of scientific plausibility, one after another of a whole series of convincing writers—Weinbaum, Heinlein, Clarke, Bradbury—an endless list, successfully modified the Martians each time the astronomical community modified Mars. And they made everyone believe them.

We believe in Martians, partially, I suspect, because we *want* to believe in Martians. Subconsciously, we have always been lonely; ergo, our ready acceptance of any evidence that there is life elsewhere in this Universe. And Mars is so handy . . .

The beginning of the end of this cozy picture of next-door neighbors started in 1965. That was the summer Mariner IV made its historic flight past the dusky planet and televised back twenty-two images of a Mars for which nobody was prepared. Gone were the canals and the great Martian civilization. In their places were craters, craters, and more craters. And the Word went forth from JPL: . . . "Mars is dead, cratered and battered like the Moon, and thus it has been for the life of the Solar System. Long live the Martians who aren't, and never were . . ."

It was a shock. Gone forever was the land of "The Martian Chronicles," replaced by the sterile hostility of a bleak (to John Q. Public) lunar landscape. I firmly believe the decline of interest in space began on the afternoon the evening editions carried front-page photographs and stories destroying, at last, the Martian legend.

We now fast-forward the film to 1969—the summer of the Apollo miracle.

I can remember being at JPL, with CBS, while Mariners VI and VII beamed back hundreds of photographs and data as they flew by Mars the month following Apollo 11. Called to comment on the air about the heretofore unseen Martian features, all I could point out was the dissimilarity of one Martian crater to another and their group dissimilarity to lunar counterparts. There wasn't even left the possibility of Martian life growing *in* the craters, as the radiometers carried by the spacecraft eliminated at a glance the hope of water on the planet. Those brilliant polar caps which everyone had always pointed to as evidence for similarity between Earth and Mars turned out to be solid carbon dioxide—dry ice! And, of course, there was no oxygen detected, nor nitrogen. I can still remember the flap about one of the experimenters who thought he'd detected ammonia near the south polar cap (indicative of some biological process). In the light of all the negative evidence, particularly the pictures, we had an enormous

amount of trouble getting even that ray of hope on the Cronkite News. And, as it turned out, he'd discovered, not ammonia, but a heretofore undetected absorption band of solid CO_2! Small comfort that, if it were not for the enormous extent of the Martian carbon dioxide fields, that particular band would probably have gone unnoticed.

Thus, in the late summer of '69, the final nail in the coffin of Martian life was hammered home to the TV audiences. Coming after the climax of the Apollo Adventure (which had been billed, for years, as an *ending,* not a beginning), this cinching of the Mariner IV picture of Mars as a dead, lifeless planet, I feel, firmly turned the national mood toward: "Why bother? Particularly when we need the money so much more at home to clean up the mess technology has made of *this* planet." It is only, therefore, by the grace of Federal bureaucracy, lead-times, and human inertia (Congress hates to turn off money to projects when more than half of it has been spent), that plans to orbit Mars in 1971 were well underway. If not, we would never have seen the *real* Mars, through Mariner IX.

Mariner IX, man's first artifact to orbit another planet, succeeded in wiping out the myth of a "dead Mars" by virtue of its ability to stay with the job. Imagine the state of Mars exploration now, if Mariner IX had been a fly-by during that dust storm. The screams about wasted money would still be heard echoing through the corridors of the Capitol. But, by being an orbiter, Mariner IX was able (repeatedly) to mosaic the entire surface of the Red Planet, from pole to pole, and thus discovered the volcanoes (evidence of an active, differentiated planet); the canyons (beginnings of continental drift, anyone?); the fascinating "laminated terrain" of both polar caps (vast glacial deposits of water-ice and frozen CO_2); and the presence of vast Martian "Mississippis" (definite evidence of a much more hospitable Mars, when rain, flooding, and huge river systems occurred throughout the Martian "tropics"). In short, Mariner IX completely upset every conclusion we had formed as a result of Mariners IV, VI, and VII.

Mars is alive (geologically) and holds the promise of life amid a variety of impressive surface topography far more interesting, potentially, than the flat, canal-crossed planet of Lowell.

As luck would have it, with much of the world press (including our three TV networks) gathered at JPL during Mariner IX's approach

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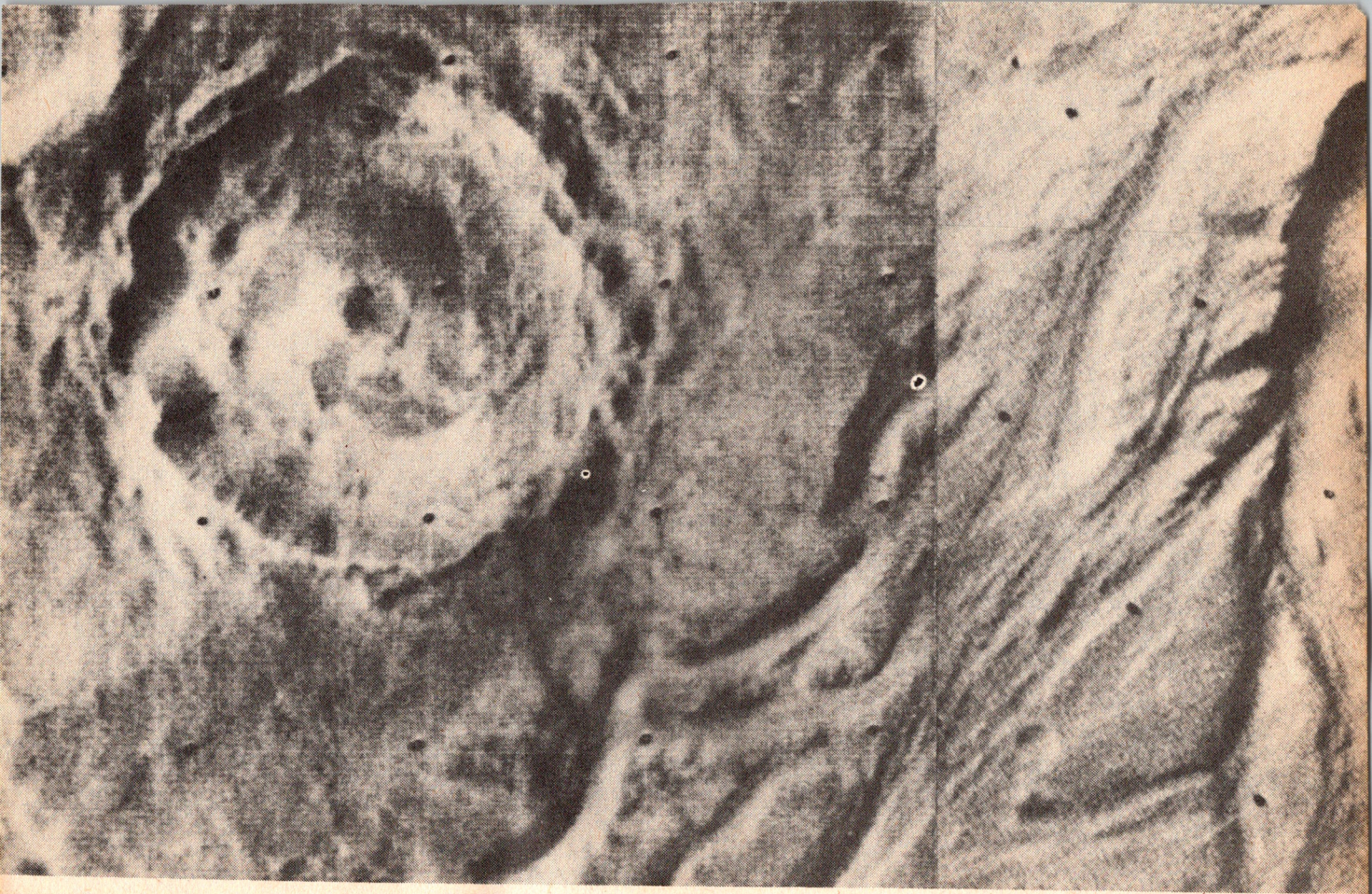
High-resolution Mariner IX TV picture of a twelve-mile-diameter crater and extensive flow ridges indicative of liquid water at some time in the recent history of Mars. Lack of significant erosion of smallest features (several hundred feet high) would indicate that Mars, to Cro-Magnon man 12,000 years ago, may have been blue-green, with clouds. (NASA)



to Mars, the Great Dust Storm obscured the approach photography which would have immediately dispelled the myth of Mars as a dead planet. Imagine the excitement which clear, pole-to-pole photographs would have created, even before we achieved orbit. Instead, with hundreds of close-ups of the storm (as one wag put it: "Sharp TV of bed-sheets followed by *enhanced* [by computer] bed-sheets"), press interest quickly evaporated, as did the television cameras. By the time the dust had settled on Mars and the incredible photographs revealing its true nature were received back in Pasadena, about the only reporter left in Von Karman Auditorium was the guy from *Aviation Week.*

But now, three years after Mariner IX, the truth about Mars is filtering out through a sort of "Martian underground." Once again, people talk about Mars with a peculiar light in their eyes. This past summer, the UFO flap was again brought to life by the suspicion that "they" might be returning the courtesy of Mariner IX by coming *here.* People believe, again. . .

Thus we stand on the eve of Viking, our first mission to another planet sent expressly for the purpose of detecting indigenous life. The Mars that Viking will explore is an absolutely fascinating place, indicating in every way that its evolutionary history created conditions in the past far more favorable for life as we know it. Even in its present state, a glaciated waiting world with a thin four-millibar atmosphere (1,000 millibars equal one Earth atmosphere) of CO_2, and with less than 30 precipitable microns of free water, certain terrestrial organisms could survive quite nicely on Mars—and have, in duplicated Martian environments, in many labs.

I believe there is life on Mars. I support this belief with a variety of slowly accumulating evidence, from interstellar radio detection of increasingly more complex organic molecules to the detection of some of those in comets; to the enormous range, adaptability and tenacity of relatively pampered terrestrial species, once evolution has begun. At the Laboratory for Planetary Studies at Cornell University, Dr. Sagan and colleagues have experimented with a variety of techniques to synthesize the "building blocks" of life from simple gaseous mixtures of water vapor, ammonia, methane, et cetera. In all their experiments, by whatever means they use to energize the mixture—electric discharge, ultraviolet light, heat, radioactive decay, even to kicking the flask (even though the good doctor alluded to this experimental technique on national television, I rather doubt its practical applicability in the Cornell experiments!), amino acids, the foundation of proteins, *inevitably* form, given enough time. And the time,

even at Cornell, is usually only a matter of days or, perhaps, weeks.

Thus, to imagine an entire planet such as Mars, with a 4.5-billion-year history, *not* duplicating at least what Cornell and Dr. Sagan have been able so routinely to achieve is very hard to accept, given the presence of essentials. From these simple experiments to a self-replicating structure such as DNA is, of course, another matter; mainly, much more time. But time is one commodity Mars has had as much of as Earth. It is, therefore, precisely to see if this phenomenon called "life" has occurred twice within the 4.5-billion-year history of the same star system, on two worlds with more similarities than differences, that Viking will be sent to Mars.

Why, then, if I believe life is there, do I also believe Viking will fail to find it? Let us follow the Viking Mission profile to the surface of Mars, and find out.

The initial Viking landing will be made, probably, on July 4, 1976 somewhere in an ellipse 80 miles wide by 373 miles long, centered at 34 degrees west longitude, 19.5 degrees north latitude. This is an area known to classical astronomers as Chryse. Mariner IX photography indicates, together with other data, that it is a level sandy alluvial plain, protected from the winds, at the mouth of a series of intriguing Martian features that look like rivers cut by running water.

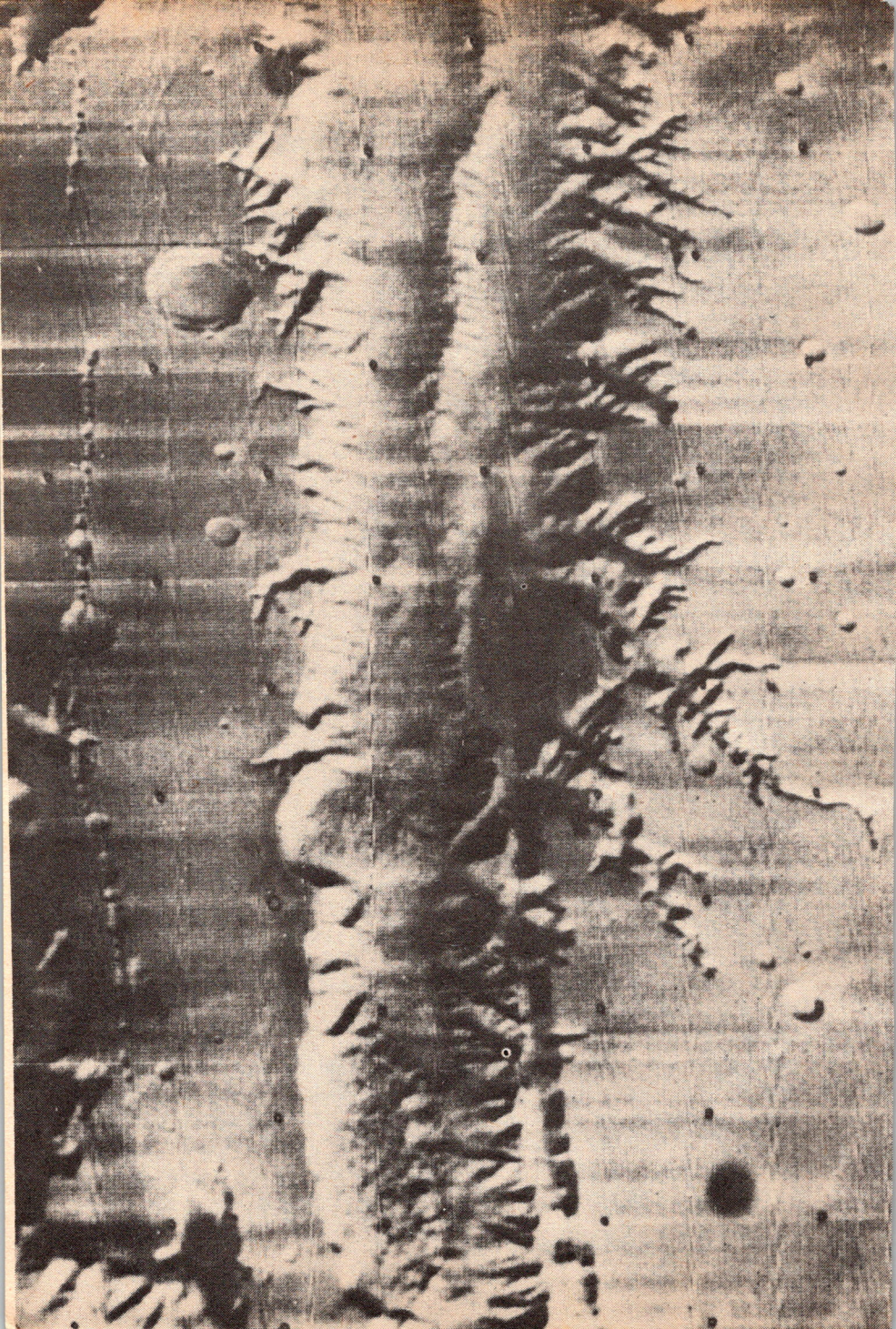
The exact procedure goes something like this:

Two spacecraft lift from the sands of eastern Florida bound for the sands of Mars on a special version of a Titan/Centaur launch vehicle. Each weighs about 7,500 lbs., a combination Lander/Orbiter. Ten months after launch from Earth, each spacecraft "team" will enter Martian orbit, the first about June, 1976, the second a month later.

The Orbiter, with Lander still attached, goes through a series of scientific measurements of the proposed landing site, including high resolution television. Bad weather, for instance, could force the choice of an alternate site if it doesn't clear within the period the Orbiter can retain the Lander in orbit, about 50 days.

After the decision to land, separation of Lander and Orbiter occurs, behind Mars, with entry of the Lander into the Martian atmosphere at about 15,500 ft/sec. The Orbiter, meanwhile, remains in its very elliptical orbit with the apoapsis (high point) above the intended landing site on the Earth side of Mars; when, at that point in its orbit, it will act as a real-time relay to Earth of data from the Lander.

The Lander, after entry, discards its aeroshell (a sort of heat-shield) and begins its descent by parachute, all triggered by a radar altimeter. During entry, and while on the 53 ft. 'chute, an upper atmo-



spheric analysis is performed. At 3,900 ft. the 'chute is cut loose and three radar-controlled 18-nozzle liquid fuel engines control the terminal descent phase, between 25 and 40 seconds in length. Touchdown will occur at a vertical velocity between 5 and 11 ft/sec., and a horizontal drift of less than 4 ft/sec. And thus the first Viking will stand on Mars, a three-legged 1,200-lb. robot on another world.

The focus of the entire unmanned planetary program for the United States is Viking. And *its* prime objective, in accordance with recommendations made in 1965 by the Space Science Board of the National Academy of Sciences, is the search for life. This is also the highest subconscious wish of the American people supporting the entire program. So, there Viking stands, a remote emissary from the green hills of Earth (to coin a phrase) on the reddish sands of Mars. What does it do?

The first thing it does is take some pictures. If we are very lucky, says Carl Sagan, we may see a silicon-based giraffe walk by, and with a camera—snap!—we've got 'im. Therefore, the camera—actually two cameras—system is classified as a biological experiment of great possible value (also, a geological experiment and, when it photographs cloud formations, a great meteorological experiment, et cetera). TV cameras are great experiments, in general. This one, incidentally, is not what you'd normally think of when you say "TV camera." These cameras, located a few feet apart for stereo, are actually nodding mirrors located behind rotating slits above a series of photo-diodes. Each picture will be built up by rotating the slit and nodding the mirror in synchronization as the resulting analog signal is formatted into digital information and fed to Earth in real-time via the Orbiter, or stored for slow transmission directly, via the Lander's own S-band dish antenna.

The initial objective will be to build up a panorama of the Martian landscape—low resolution, at first, and later, high resolution, in natural color. Now a problem arises. One of the hopes is that, besides Carl's giraffe, investigators, in addition to sand, sand, and more sand as well as hills, arroyos, and a few rocks, will see a plant. Wouldn't that be fantastic? Land on Mars, turn on the camera, and—zowie!—a genuine Martian cactus. Right? Think a minute.

What would it look like?

Terrestrial plants evolving on the same planet look enormously different. What, then, would an indigenous Martian example of local flora look like, after several billion

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Section of 2500-mile-long Martian Equatorial Rift. Feature indicates vast internal forces reshaping surface, belying previous concept of Mars as a "dead" world. Note intricate, tributary-like erosion at heads of blind canyons. Features appear now to be caused by water—flowing in very large quantities. (NASA)

years of completely independent evolution? But, you'll protest, it has to have leaves of some sort to absorb sunlight. Does it? It may use lenses, or mirrors, or just be a large black blob absorbing all wavelengths and using whatever's left over from photosynthesis, for just plain heat. No, the first problem will definitely be: Is that thing over there a rock or a *Martianus indigenous?*

Leaving our television experimenters to puzzle over their ambiguous "thing," we shall move on to other experiments this complex robot has brought to Mars. Viking is many things to many people. It carries a seismometer, to detect and locate (if they're big enough) Marsquakes. One good one of sufficient power could allow us to map the entire interior of Mars, chart its mantle, crust, and core, if it has such features. It would also, presumably, detect the footfalls of Martian elephants if any tried to sneak past the Lander in the dark. Since there is a high degree of skepticism over such organisms (higher, even, than the previously mentioned giraffe), the seismometer definitely is in the geological, not biological, category.

Viking carries an X-ray fluorometer, a very small device (weight less than 2 lbs.) which will zap a sample of Martian soil with X-rays of a known spectrum and detect the resultant emission. The objective: to assay nonbiological elemental constituents of the Martian surface.

This experiment may tell us what trace elements Martians contain, but it will not directly tell us about life on Mars.

Viking carries a set of rather simple but effective meteorology sensors, on a deployable boom which will measure such obvious things as air pressure, wind speed and direction, and relative humidity. Since most of the so-called seasonal activity appears now to be meteorologically related to wind-deposited dust, this experiment should give us good first-hand data on actual Martian weather (oh, yes, temperature will also be noted) for input to a computer forecast of weather generated from planet-wide atmospheric observations carried on by the Orbiters.

This experiment, only very indirectly, is related to the central question of detectability of living organisms on Mars. But more of this aspect later.

Viking carries three prime experiments related to the question: Is there life on Mars? Two of these, the TV system and a device called a Gas Chromatograph Mass Spectrometer, will indicate biologi-

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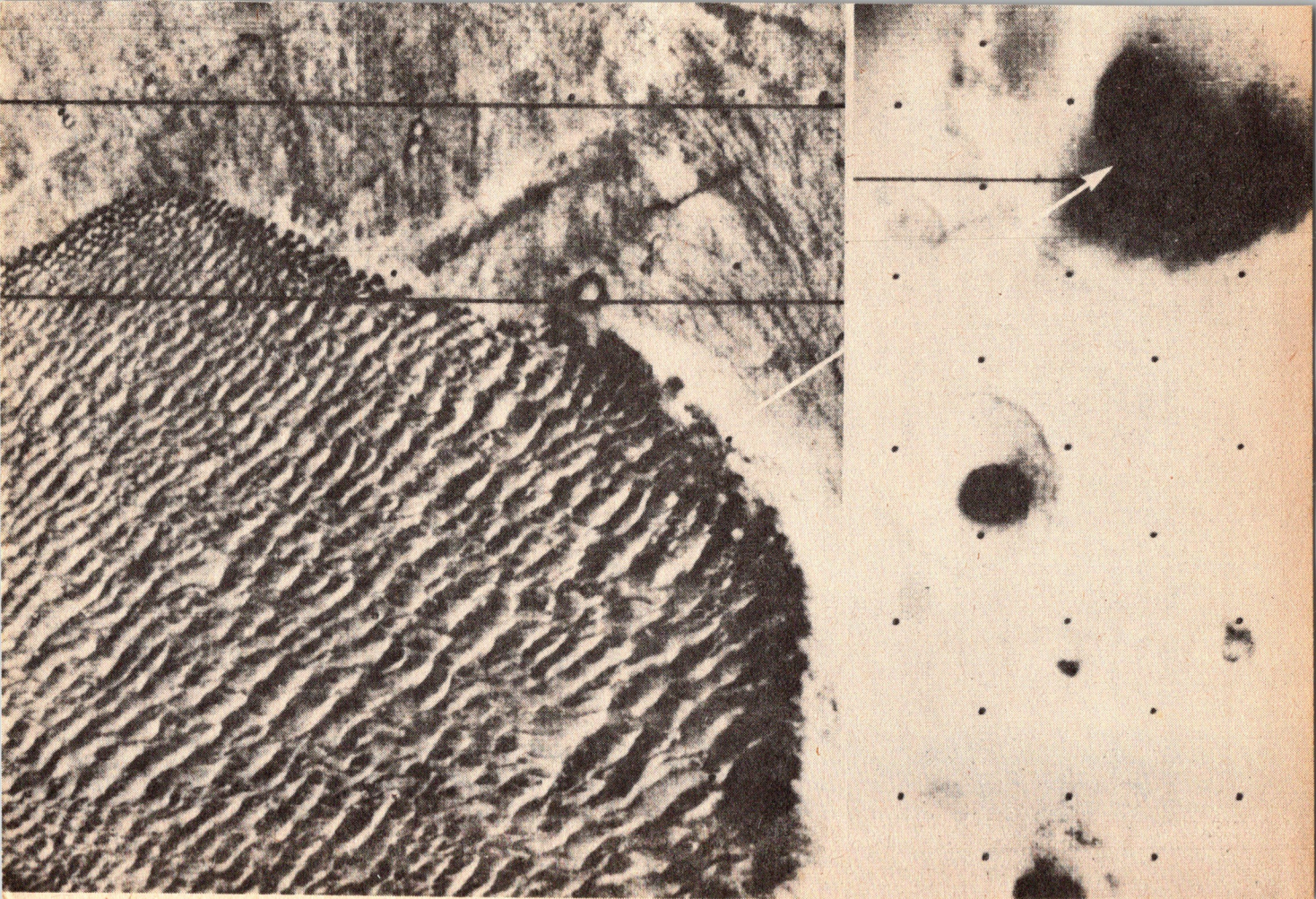
This close-up Mariner IX composite reveals extensive evidence of blown and drifting sand. Dunes are approximately one mile apart, indicating ample sand for several thousand feet vertically as well. Such features appear common to the present Martian surface. Protected interior of crater creates conditions for standing wave pattern. (NASA)



cal activity through indirect means (unless we see Carl's creature). The TV could detect burrowing (Martian moles?), past sedimentation of a biological origin on cliff walls, or (!) a technological artifact. The GCMS is designed to sniff the lower Martian atmosphere and to detect very low concentrations (less than one-tenth part per million) of such organic compounds as ammonia, methane, hydrocyanic acid, and acetylene—possible indicators of biological activity. In addition, it will detect such "ordinary" atmospheric constituents as oxygen, nitrogen, et cetera. In fact, any species from atomic mass 12 to 200.

In addition to measuring atmospheric concentrations of possible significant compounds, the GCMS has the capability of performing three separate soil analyses of 100-milligram samples. Its limit of three is set by the necessity for carrying a finite supply of hydrogen to flush the released gases through the detectors. When the hydrogen is gone, the soil analysis part of the GCMS will be over. However, the atmospheric analysis will continue until the end of the mission (nominally 90 days after touchdown, although most project people fully expect Viking to operate for at least a year).

The results of this experiment could cause a lot of confusion. Positive detection of organic materials in the atmosphere, particularly if they're seasonally dependent, would indicate possible biological activity, depending on the nature of the molecules detected. Organic materials in the soil, however, could or could not indicate living organisms on Mars. JPL recently produced amino acids under Martian-like conditions by irradiating a mixture of CO_2, water, and silicate dust mixed with limonite (a hydrated iron oxide). Thus, even complex organics could be produced abiotically.

That leaves us, then, with the prime biological experiment on Viking, designed to detect living, breathing Martian micro-organisms. The biology experiment is actually three experiments in one, each designed to check the validity of the other, as well as to test separate mechanisms for growth and metabolism of Martian life-forms.

Experiment number one I will call the "Mars-as-it-is-now" experiment. It consists of placing a small sample of Martian soil in a sealed chamber illuminated by an artificial light source which duplicates the spectral and intensity aspect of Martian sunlight. Carbon dioxide, the overwhelming natural constituent of the Martian atmosphere, will be admitted from an onboard spacecraft reservoir "doped" with a percentage of radioactive Carbon-14. After a suitable period, the CO_2 will be removed from the chamber and heaters turned on to raise the temperature of the sample to about 600° C. This will drive out all vola-

tiles from the soil, including any CO_2 respired by Martian micro-organisms in the sample through photosynthesis. The Carbon-14 tagged CO_2, measured by a Geiger detector, will indicate the extent of such photosynthesis.

This experiment, based, obviously, on the assumption (as are all the Viking biological experiments) that Martian life will be carbon-based, will tell us, if positive, that the micro-organisms *like* the present Martian conditions and will give us an indication of how rapidly the metabolic processes of such organisms proceed. If the experiment detects nothing, then we will begin a long list of, "Well, maybe we landed in the wrong place . . ." or "Maybe the season's wrong . . ."

Let's go on to experiment number two.

In this chamber the soil sample is "fed" a special nutrient containing a Carbon-14 tracer. The idea here is that if the organisms digest the nutrient, then, in the absence of sunlight, CO_2 will be released as a waste product. Again, the radioactivity associated with the released, tagged CO_2 will indicate metabolic activity.

Experiment number three is essentially the same as number two, with the exception that not just tagged CO_2 will be measured but, by means of a gas chromatograph, the complete evolution of respired gases in the chamber will be monitored as a function of time. These will include such exciting compounds as hydrogen sulphide, hydrogen, hydrogen cyanide, nitrogen, oxides of nitrogen, ammonia, oxygen, and methane. The obvious advantage here is that it is just possible the metabolism of Martian micro-organisms may lead to the formation of gases other than carbon dioxide or carbon monoxide. This experiment will detect them.

That's it. These three basically very simple experiments are what the future of the American Space Program depend upon. Now, why do I think the sum of all their sampling and heating, detecting and "doping" will turn up zero evidence of Martian life? The problem is Mars.

When I was developing my addiction for astronomy, hanging out among dusty library shelves where sunlight hadn't penetrated in many decades, I once came upon some old Bonestell representations of what the end of the world would look like. I was fascinated by the sight of ice-laden skyscrapers and the sun, framed by the icy tendrils of a frozen bridge, glinting coldly off the surface of a world numbed beneath the cold of a dying star. I can still remember the wonder of contemplating the process whereby the actual *atmosphere* would freeze and fall to the ground. And there was a sort of wistful afterthought: pity it won't happen here for another five *billion* years! . . . My disappointment was premature—

by about five billion years!

Mars, apparently, is such a planet. Through a combination of its location on the outer edge of the "habitability zone" of the Sun (where water will remain liquid) and the pronounced eccentricity of the orbit (e = 0.093), the Martian climate fluctuates enormously.

Mars is presently in its "frozen atmosphere," glaciated state. Mariner IX photography of both polar caps revealed vast areas of laminated terrain, layered in receding steps, each step containing between 20 and 40 layers, with between 200 and 400 layers in all, each approximately 30 meters high. This amounts to approximately a mile of sediments at each pole, covering several million square miles, and containing, if vaporized, enough frozen CO_2 and water to produce a Martian atmosphere equal in pressure to the Earth's!

It is in the polar glaciers, then, that the Martian atmosphere is currently "hanging out." Somehow, in the past, that vast mass of carbon dioxide and water got frozen out, the entire atmosphere "falling to the ground" as in the Bonestell painting, and there it is today. That the process is a continuous one can be seen from the layering of light and dark material making up the "piled-up poker chip" pattern. The light stuff is thought to be the water-ice and CO_2; the dark stuff sand and dirt blown there by the periodic Martian dust storms. The length of time it has taken to accumulate these glaciers is presently unknown, but there are some intriguing suspicions.

This fascinating state of affairs seems to be occasioned by the combination of the tilt of the Martian axis, the eccentricity of its orbit (unlike the Earth *this* has a much greater effect on Martian seasonal temperatures), and the 50,000-year precessional period of Mars itself. Apparently, there are times when these three factors conspire to create a "cold-trap" at the poles.

Imagine a sunny day on Mars about 10,000 years ago. The atmosphere, mostly CO_2, a moderate percentage of water vapor and a goodly percentage of oxygen and nitrogen, is pleasantly dense and produces a variety of Earthlike phenomena—rain, weather fronts, lightning, et cetera. Because the pressure is so high, water is liquid on the surface, forming moderately large lakes. Days and nights are not enormously different in temperature, even though Mars is almost half again as far from the Sun as Earth, because of the "greenhouse effect" of the CO_2 and water vapor. Martian life (!)

The Mars of Now. Mariner IX photograph covering the planet from North Pole, layered with mile-deep layers of frozen CO_2 and H_2O, to south of the Martian equator. The four huge volcanic piles, Nix Olympica to the left and the other three along a diagonal line to the right, are also visible. The west end of the enormous equatorial rift is just visible at the southern limb. (NASA)

through photosynthesis converts the carbon dioxide and water to free oxygen and more organisms. Life is pleasant, as water fills the rivers and lakes around the equatorial region and rain washes the air fresh each Martian dawn.

But Mars is moving inexorably in its orbit and about its axis. Precession tilts the hemispheres farther and farther away from alignment with the orbit at perihelion; and bit by bit as the years slide by, each Martian winter in one hemisphere is colder than the last, trapping a bit more snow and ice, and each summer in the other hemisphere is not quite as warm as in the years before and the snow and ice at its pole melts less and less.

The Martian organisms sense it is Time, once again. The long winter is at hand. Slowly, as the rivers run dry and the water migrates toward imprisonment amid the polar ice-fields, the process of photosynthesis runs down. Organisms prepare for winter and the long period of hibernation until the next Martian spring—12,000 years away. Oxygen, no longer produced in equilibrium with oxidation of the Martian surface, rapidly becomes a trace constituent, along with water. Ozone, the protective ultraviolet screen formed by moderate amounts of oxygen high in the stratosphere, loses its ability to shield the surface from direct ultraviolet radiation. Nitrogen, formerly present in the atmosphere, is now ionized and combines rapidly with surface materials to form nitrates.

The atmosphere, now almost entirely CO_2 and without the heat trapping capacity of water, blows with increasing strength between the warmth of the sunlit side of Mars and the cold of the Martian night and poles. Without water to consolidate the surface, increasing quantities of dust are blown high in the atmosphere. The great Martian Dust Storms begin, blanketing craters, canyons, river valleys, and hibernating Martian organisms beneath a deepening layer of eroded Martian sand.

For life, this is ideal, as without significant amounts of ozone to protect the surface from direct UV, any living thing not covered by a thick layer of sand and dust will be irradiated back into relatively simple molecules.

The Martian precession continues, and the polar temperatures become more asymmetrical. At some point, probably during a particularly intense, planetwide dust event, the lower atmospheric temperature over the winter pole drops below the condensation point of CO_2 and the Mars we know is born. Within a relatively short period of time, as CO_2 snowstorms remove the remaining atmosphere and deposit it upon the polar caps, the loss of the greenhouse effect rapidly diminishes the general temperature, making it easier each winter for more CO_2 to freeze and become a layer at the poles. At last the atmospheric pressure stabilizes at 1/1000th of its former value and deposited dust melts just enough

Lander Functions	Design Features
Communication and data handling	Ultra High Frequency (UHF) transmitter and omnidirectional antenna for relaying data to orbiter overhead. S-band (about 2300 MHz) transmitter and 30-inch paraboloidal antenna for direct telemetry link to Earth after completion of landing phase. Tape recorder and magnetic-core memory store data during entry blackout and when Earth cannot be reached. Commands from Earth may be received by either the omni antenna or the paraboloid.
Power supply	Two radioisotope thermoelectric generators (RTGs) using the heat from decaying plutonium-238 deliver about 50 watts of constant electric power. The RTGs also supply heat during the cold Martian night. Batteries provide power during entry and landing and thereafter during peak loads.
Propulsion and attitude control	Eight small hydrazine jets around rim of aeroshell orient lander for deorbit maneuver. Each jet delivers about 10 pounds of thrust. Four of these jets provide the deorbiting impulse. Six different hydrazine jets on the bottom of the lander control its attitude during terminal descent. Three 600-pound-thrust hydrazine engines slow the craft to a soft landing. (Figure 12.)
Guidance and control	Radars measure the altitude and rate of descent. Gyroscopes and accelerometers help determine lander attitude. These data are fed to a computer which controls the engines and jets described above. (Control from Earth is impossible because radio signals require almost 40 minutes for a round trip.)
Structure	"Canned" lander measures about 12 feet in diameter and 5 feet 9 inches high. It weighs about 2200 pounds. As described in text, the lander is a triangular box about 8 feet 4 inches on a side.
Launch vehicle	The Titan-Centaur
Tracking and data acquisition network	The Deep Space Network, with 85-foot and 210-foot paraboloids for tracking, data acquisition, and sending commands from Earth-based controllers.

*Some of these data, particularly weights, may change slightly as design and fabrication proceed.

each Martian summer to replenish that which is frozen in the fall. The long winter has arrived.

This state of affairs—the Mars we know—probably continues for almost one-fourth the precessional cycle, almost 13,000 years. It is only when both poles begin to receive *equal* amounts of heat during the year, that this "cold trap" effect can be reversed. Thus Mars exists as an almost atmosphereless, desiccated planet bathed in raw ultraviolet radiation, smothered in fierce, erosive planetwide dust storms and whipped by thin cold winds exceeding, at times, 200 miles an hour, for most of its existence. And yet, evidence exists that, briefly—a few thousand years out of each 25,000—a vast improvement in this forbidding Martian environment takes place.

It is for those brief millennia of spring (when rain-washed zephyrs fill the Martian skies with lightning and the waters again come flashing down the canyons and ancient river bottoms, sluicing through the dust and awakening the sleeping Martians in their beds) that I believe Life waits.

Thus, with its extended claw, Viking will have come amid the barren dunes of winter to sample mere inches of the surface, the irradiated, sterile wind-blown sands covering the alluvial plain of the ancient torrents of Chryse.

And, all the while, a mere hundred feet or so beneath its ineffective sampler, but as remote as if Viking were still standing on the surface of Earth, the Martians slumber on—awaiting patiently the spring and the rains which will, inevitably, wash away the dust of 12,000 lonely years.

If Viking's failure, through Martian life's sophistication rather than simplicity, results in public disappointment and withdrawal from space, as I foresee, then this could be the consequence:

The Martian spring arrives and with it the pulse of life awakens once again. In the midst of this activity an artifact stands silently upon the plain, rising water swirling about its half-hidden alien shape. It is an ancient emissary from another world and time. In the cosmic scale of such events it came a breath too early to fulfill its mission and because of that its successors never came at all. They, like their creators, perished shortly after the rejection of the Solar System by the inhabitants of planet Earth, millennia before this newborn Martian spring.

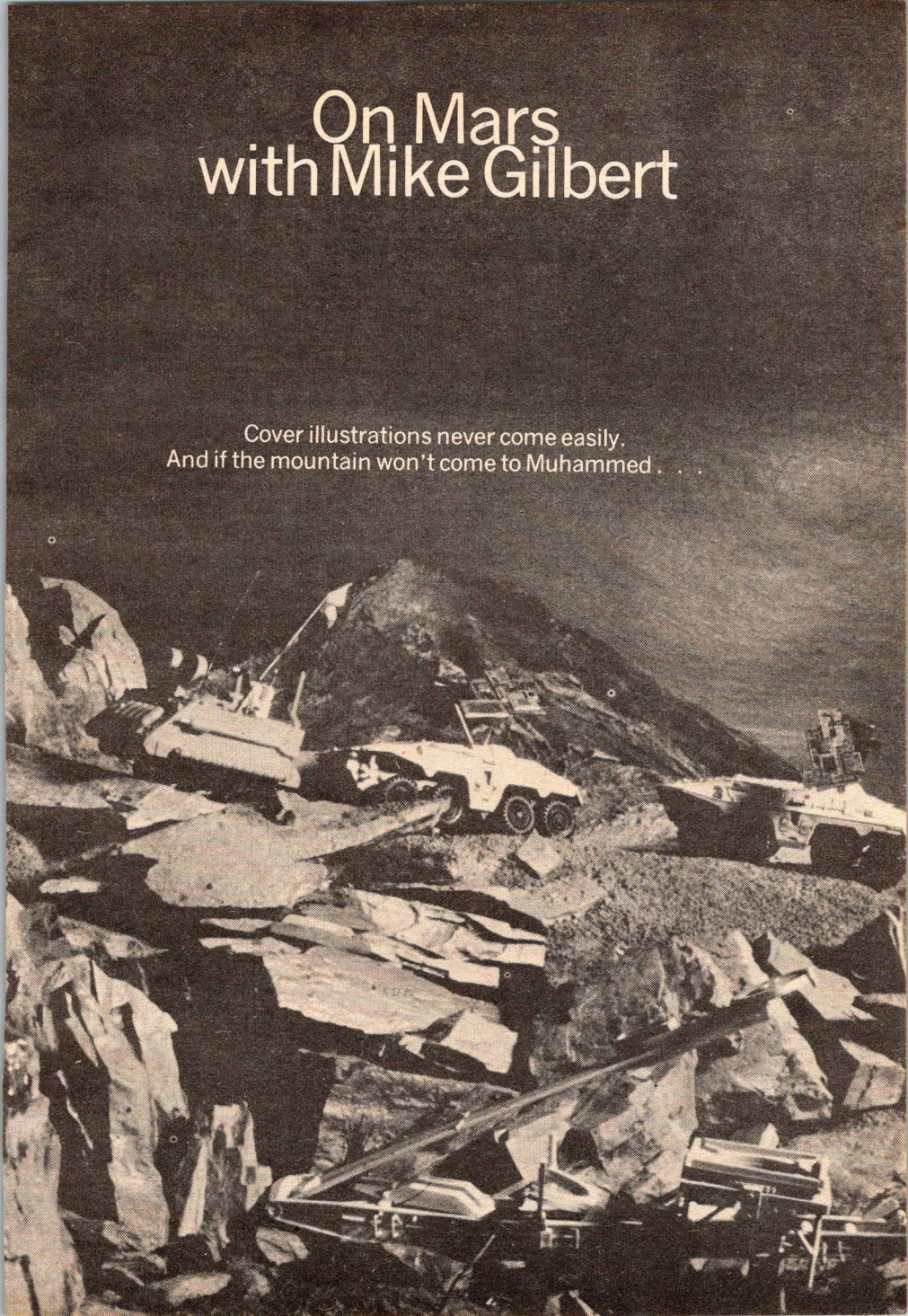
Thus life on Mars awakes—alone—and thus it will remain. ■

ABOUT THE AUTHOR

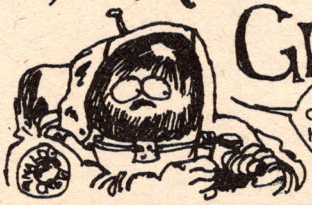
Before becoming a full-time writer, Richard C. Hoagland was Coordinator of Public Affairs and Special Events at the Hayden Planetarium in New York City. Prior to that, he worked closely with Walter Cronkite as Science Adviser to CBS during the Apollo Program.

On Mars with Mike Gilbert

Cover illustrations never come easily.
And if the mountain won't come to Muhammed . . .



ON MARS WITH MIKE GILBERT OF ANALOG ASTRONAUTS



Mars, the red planet, mysterious, unreachable, the illusive world of man's imagination. An arid dust bowl millions of miles away from Earth that we are not likely to set foot on in this century.

Well, forget all that. It's utter nonsense. Man has already set foot and other parts of his anatomy on Mars. Mars, the unattainable, is only fifty feet from where I sit. And as for setting foot on it, my wife, Sheila, has done so much too often for her own comfort, stubbing her toes and cursing manned exploration.

I made Mars to meet editorial requirements. It's only a replica, and it's only a miniature, but it's Mars and I made it.

I also do 25mm miniature wargame figures and have an army of an estimated 8,000 soldiers which tend to spread uncontrollably faster than I can obtain shelves; this, combined with the four-foot-deep Mars diorama, made raucous parties difficult. One famous night, swimming with Scotch, Schoenherrs and Gaughans, a startled, seated Jack Gaughan made the discovery

that, "I've got my backside on Mars and my foot in the Prussian Army."

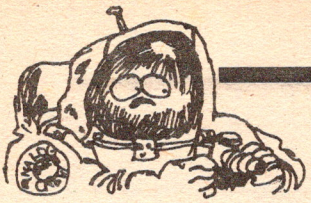
Jack Gaughan sits down.....

Does all this confuse you? Well, let me explain. As an illustrator, miniature figures painter, and a collector of rockets and other science fiction models, it was a natural step for me to begin photographing science fiction scenes when I acquired my first good camera. About two years ago when I was up at Analog, I showed Ben Bova some of the shots I had taken using astronauts, Mars landers and the windswept snowdrifts of upstate New York, which bear a striking resemblance to the snowcaps of Mars.

Ben was quite enthusiastic, and with the recent pictures that Mariner IX had been relaying back to Earth as an added impetus, we conceived the idea of creating and photographing a Mars' surface scene to be used when an appropriate cover story came along.

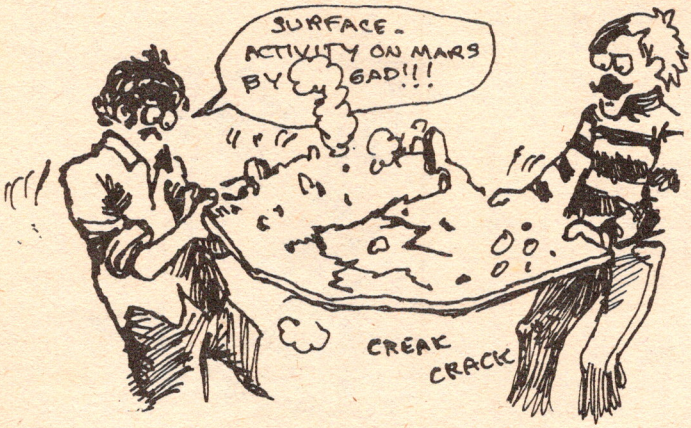
For assistance in the accurate creation of Mars, I would like to thank the JPL Labs in Pasadena for the use of their Mariner photos, the kindly editor of Analog for other useful information, and my special thanks to John Schoenherr, who not only assisted me in comparing the Mariner photos to similar terrestrial geological formations but also allowed me to rob his country driveway of some great Mars rocks.

"Jack Schoenherr supervises gathering of Martian Rocks."



And finally to Mars. Mars is composed of two 48-inch-by-24-inch formed sections of landscape. The base of the diorama is masonite and the terrain was built up using papier-mâché, rocks, acrylic liquid plastic, varying grades of sand and water, plus a plastic bucket. The astronauts are 25mm plastic figures, much altered from their original forms, and the ore carts and command vehicles were heavily converted from World War Two tank models. The mining machinery was built from various model pieces culled from everywhere in my collection—much in the way that the "2001" *Discovery* was built.

My first attempts to photograph Mars were only slightly less than disastrous. Waiting until some unsuspecting friends came to visit, I enlisted their aid to move the diorama outdoors for photographing in natural light away from the shadows of the venetian blinds. What a mistake that was! Mars has too much mass to move out of its orbit. With many groans, half of which issued from me, we moved the diorama. Mars' surface began to shift. Fissures appeared, dust flew, and Mars was suddenly in need of a face-lift.



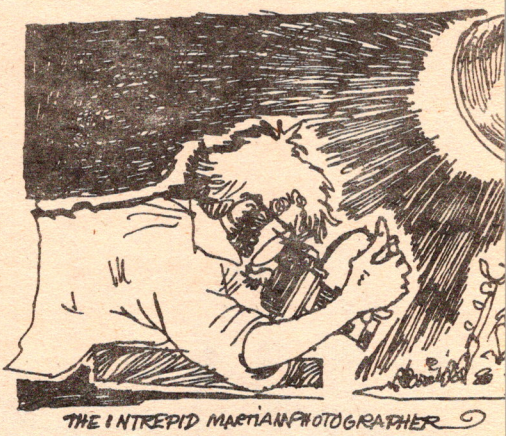
As a result of this misadventure in planetary engineering, Mars remained in my studio to be photographed under the much safer conditions of artificial lighting, and I

learned a lesson which every Fifteenth Century cleric knew well: "The planets do not move from their appointed places."

Eventually, the diorama was photographed many times and many ways. The first photographs were taken to determine lighting and to be sure the diorama really looked like Mars and not like the badlands of the Southwest. After determining that it did look real, the format had to be changed into an Analog format: that is, a vertical composition with a strong right-hand design element.

Once the basic composition was decided upon, more pictures had to be taken to see how the design worked. With these photographs in hand, we began committee meetings to determine how the cover should look, that is: put the astronauts here rather than there, move that machine, more sand, more light, different-colored suits, lift that barge and tote that bale . . .

It took many such meetings of



editor, art director, artist and circulation director to decide and agree on the final scene that ended up on the cover. The picture on page 71 shows how far the cover has come since the soft summer winds blew over Schoenherr's driveway of Martian rocks. ■

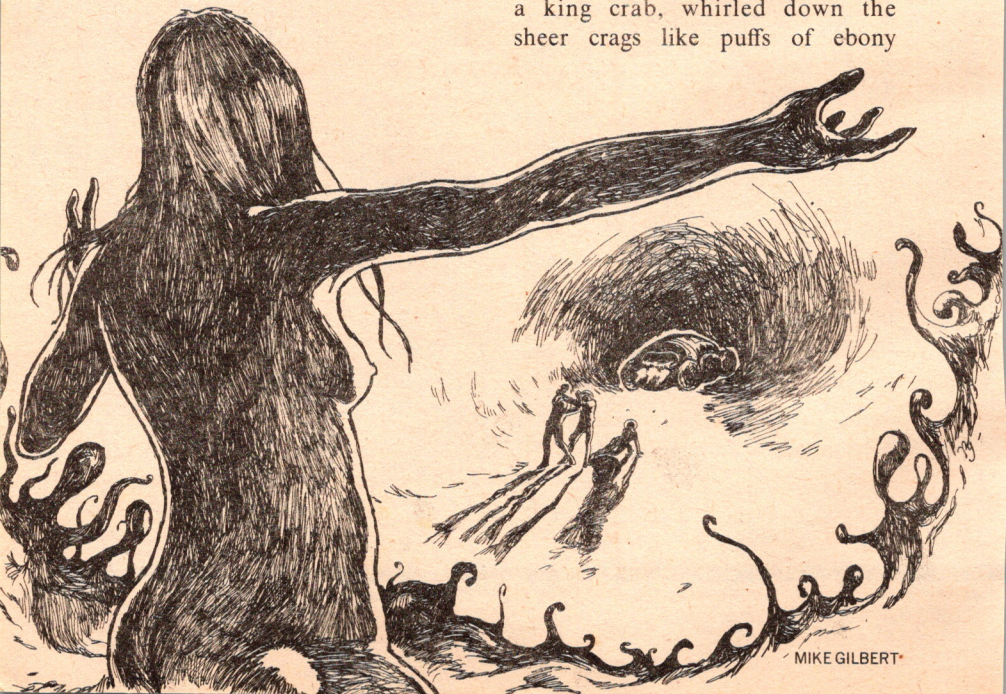
Encounter Below Tharsis

Where there's life there's adaptation—and danger.

BOB BUCKLEY

The wind was out of the west. It carried before it a ruddy haze of dust that whispered gently against the deserted recreation dome. All about lay the canyon, an abyss of ragged, multicolored stone. It seemed to cup the Noctis Lacus Mining and Exploration Settlement with friendly, severe shelter.

Tom McCormick rested his broad forehead against the cool plastic of the port a moment longer, enjoying the view while he attempted to ignore the persistent twinges of conscience that threatened to tear him away. The evening descent of the sand spiders had begun. The tiny wisps of life, not spiders at all but small insectoids with limbs as attenuated as a king crab, whirled down the sheer crags like puffs of ebony



MIKE GILBERT

snow, their unbelievable numbers concealing the brilliant exfoliations of lichen that stippled the cliffs like heatless flames of orange, scarlet, and chrome yellow. For the spiders the dunes that mounded the flats spelled insulated safety from the rigors of the freezing Martian night.

The second man in the dome lounge was not interested in the view. He was young, with plain, strong features, and his large hands almost swallowed up his knees as he sat hunched on the edge of the couch staring at the free-patterned floor of fused plastic.

"I've never asked you for anything before, Tom, but . . ."

The little biologist turned away from the port with a long sigh. "Then don't ask now, Paul. You know my position, and I think you understand why I came to it. If it weren't that you were being . . . well, we can let that drop for now. What matters is that I'm rejecting an applicant I suspect to be unable to adjust to colony life. If Jeanne won't fit into a crew successfully there's no way she can fit into the colony. She might not even survive."

McCormick's light cotton tunic, an import from the pressurized farms of Hellas City, revealed a well muscled, but compact frame, for he was just barely over five feet tall. But it was his face that caught and held the attention: the skin was patterned by a tangled web-work of tiny wrinkles that puckered into tiny sunbursts about his deep-set eyes.

"You probably think I'm being paternalistic, Paul," he went on. "Perhaps I am. I'm remembering a dome blow-out a long, long time ago when the Noctis settlement was a single dome and three prospectors. One of them was a girl. Her name was Jeanne, too, fresh out from Earth she was." McCormick glared at the other. "I couldn't save her. But at my age a man's already made a lot of mistakes. He avoids making them again because he just doesn't have the energy. If you were older you'd understand."

"I understand just fine," Culkin snapped. "What all this boils down to is prejudice." But if the boy was expecting an angry retort he was disappointed, for McCormick only smiled sadly. Behind him the port was glowing with a soft, rosy-colored twilight. The flats were in deep shadow, now, and in another few minutes the entire canyon would be dark.

"She's been pretty friendly, hasn't she?"

Culkin flushed a deep crimson that was not entirely due to the sunset flaming along the bluff-tops. "That's not why I'm defending her."

"Isn't it?" McCormick's eyes were as expressionless as polished glass.

"No! Jeanne's an excellent geologist. And Sheldon's given her top

scores in sandcar handling."

"And that's not all she handles well." The overhead lighting of the lounge came on with a shimmer, making it seem even more spartan. The Noctis Lacus Settlement was still little more than an outpost. The main colonies at Claritas and Hellas were different, both of them growing up around subsurface aquifers and rich loess soils with the farming supplemented by ore extraction contracts leased to Lunar Industries and Homeworld corporations. Noctis would grow, also; but in time, not immediately. The caverns had to be mapped, the ore veins identified, before the heavy work could begin. But there was a future in the great canyons. McCormick knew it, and so did the slim brunette standing framed by the airseal of the portal. It had been Norah who had convinced McCormick to bring the crew west and hire their two cave buggies out to the Noctis division of the Bureau of Extraterrestrial Lands, the only government on Mars. Waist-length braids swung like glossy snakes about the girl as she moved into the lounge.

Culkin seemed to sense the arrival of an ally. "Tom's rejected Jeanne Alexander as a replacement for Sally. Can you believe that, Norah?"

The girl laughed as she threw herself down on a couch. "Yep." Then she looked at McCormick. "Why?"

For an answer the biologist fished in one of his tunic pockets and tossed a tiny object to the girl. She caught it on the fly automatically and easily. "Know what it is?" he asked.

Norah turned the thing about in her fingers. "Drug capsule with a red gel coating. So what?"

"I found it in my office after Alexander had been there for an interview. She doesn't know she dropped it."

"Must be pretty terrible from the way you're looking at it, Tom."

"It's an engram transplant, a memory capsule. No way of knowing precisely what it is without ingesting it. Might be a technical journal article, or a joyride across the ice fields of Titan."

"Oh!" Norah put the capsule into an empty dish and wiped her fingers delicately on her pants-leg. "I wonder how she got it past the customs inspection on Phobos?"

"It's no crime to possess engram caps," Paul Culkin protested loudly. "Any of us could place an order with Earth. The things are expensive, but certainly not the instruments of destruction that Tom accuses them of being. The caps are even catching on at Luna, and I think that's all the more reason for *not* rejecting Jeanne just because she conforms to Homeworld technology and mores."

The landscape outside the port was growing darker. The sky was almost black, holding a thin tracery

of ice clouds that were slowly drifting southward, toward the ice-bound pole. The highlands atop the bluffs would have another thirty minutes of light, but for the canyon abysses night had fallen already.

Norah shifted on the couch.

"Well, we need a replacement for Sally, Tom. There's no getting around that. If you delay any longer we're going to lose credits. It's no good just letting a buggy go unused. And the Bureau won't like your rejecting an applicant without so much as a trial run. I also agree with Paul that you can't reject her solely because she lives up to Earth mores."

"You'd have me sign on a New Guinea cannibal just so long as he could drive a cave buggy," McCormick said with a sigh.

"That's an idea." Norah grinned. "Let me propose a compromise. Give Jeanne a chance to prove herself in the field. We can rearrange buggy crews."

"You want me to double up with Paul?" McCormick glanced at Culkin thoughtfully. "That would work. He's a geologist, and that maintains technical balance. But still . . ."

"I like it," Culkin declared loudly, standing up to begin pacing the floor, his hands clasped behind his back. "It gets you off the hook, Tom."

"It gets nobody off any hook. Mars can still kill, especially in the caverns, and your Jeanne doesn't understand us, nor does she understand how a crew functions. On Earth the individual works for himself, and equality is legislated. Put someone like that into the Bureau system and you've got all the makings of bad trouble."

"I'm willing to risk it," Culkin shot back angrily.

"Damned decent of you, considering it's going to be Norah who's taking the chances."

"Relax, Tom." The girl was smiling. "If I don't mind a risk, don't you mind it for me. I'm a big girl, and besides, it's a lot harder for a woman to fool a woman."

The golden bar of sunlight that had emblazoned itself across the east rim of the canyon narrowed to a sliver and vanished. Black shadow swallowed up the port. Off in the distance, where the sole roadway climbed out of the canyon on a series of switchbacks, the headlamps of an ore truck threw banners of white glare across the walls of rock, painting them for an instant in stark relief.

"One patrol?" McCormick asked finally.

"It only takes one to smoke out a loser," Norah said quietly. "Tomorrow you can check her out on the buggies while Paul and I finish up that workdome contract. That night we go down in the caverns, and when we get back the lady might very well ask for a transfer on her own. The caves can do that to a newcomer who goes deep for

nothing more uplifting than a few credits."

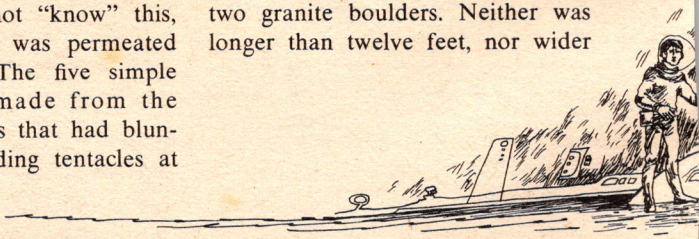
2.

The creature was without awareness, without identity. It could not comprehend the endless dark, nor the slow ebb of heat energy into its jelly-like body through the thermopods bedded deeply through adamantine rock toward the magma pockets that underlay the deep caverns. In its structure, part protoplasmic, part mineral, the creature was a curious combination of life and unlife. It had existed in an unchanging state for millions of years. It had sensed when the floods had come, it had sensed when the torrents had drained away. Its main body lay unmoving within the ancient grotto with the evidence of its hunger all about: empty crevices where once there had been rich veins of ore. The feeder tentacles had etched the stone with powerful acids and left it pocked and crumbling. Now the ores were played out. They had lasted long, but all things come to an end. The creature was quietly, inevitably starving to death. It did not "know" this, but its great bulk was permeated with foreboding. The five simple ganglia, copies made from the brains of insectoids that had blundered into its feeding tentacles at long intervals, were alert. But there was no prey to be found, or absorbed. Dissolution was coming rapidly. Nothing was left to it but division, the entire bulk disintegrating into a thousand-plus mobile, diminutive reproductions, one or two of which might chance upon another rich grotto and grow to maturity, sending thermopods down to suck the heat of the planet. Already the process of division was beginning as chromosomal structures within the central cell mass began aligning into a precise and complex pattern.

3.

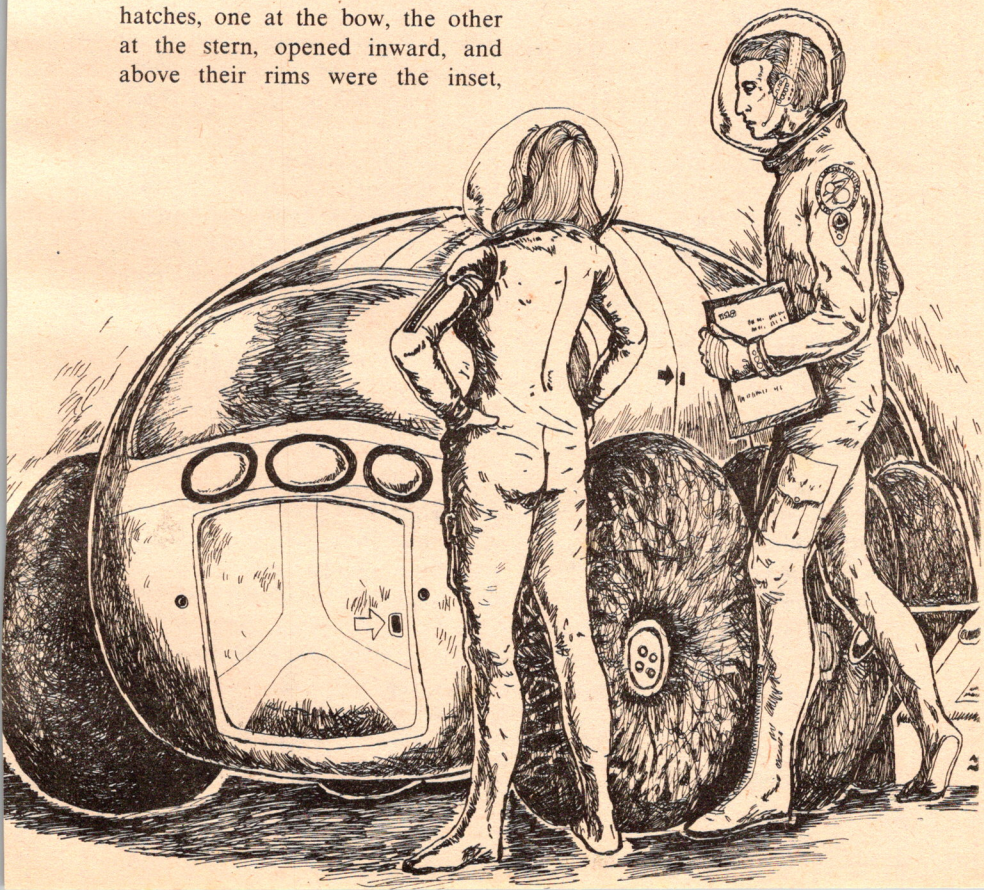
"Coffins with wheels!" The girl's tone implied that she was not impressed by the two cave buggies drawn up in the equipment dome. She put her gloved hands on the hips of her suit and shook her head from side to side within the transparent helmet.

McCormick grinned. He knew the buggies weren't pretty and he didn't much care. They had been designed for strength, and they gave off the massive presence of two granite boulders. Neither was longer than twelve feet, nor wider



than six, even taking into account the six large wire wheels arrayed along the lengths of the tubular hulls, three to a side. Each of the vehicles was double-ended, since rarely did a buggyman find himself with the luxury of the room to turn around. A pressure-tight bulkhead separated the forward control-room from the rearmost, and the hull itself was 200mm machined Martian steel, the finest this side of Luna, with a bright orange envelope of Teflon bonded over the metal. Two hatches, one at the bow, the other at the stern, opened inward, and above their rims were the inset, glassine-shielded driving lamps, three to an end, and above these the tiny driving ports arrayed in a curve before the padded couch on which the driver had to lie, belly down, the entire trip. Caving was profitable and interesting, but no one as yet had been foolish enough to acclaim it as fun.

McCormick reached through one of the open hatches and moved a switch on a control panel. A sec-



tion of hull rose with a hum, exposing a slim pod mounted on an extensible pivot arm.

"This is the sensor pod," he explained. "It contains a spectrographic laser, a TV camera, and a searchlight. Both crewmen share it, but it is usually operated by whoever isn't driving the buggy at the time. Now, climb inside. You've got until 1400 to memorize the controls. I want you to be able to work them in complete darkness, because even in a power outage the motors run. They're fail-safe, and the wire wheels serve as sensing antennae even if you can't see the cave walls. If you want to live to be an old caver you'll need every trick we can teach you."

The girl dropped into a crouch and peered through the open hatch into the interior of the buggy. "Not much room in there, is there?" When McCormick didn't answer she frowned. "Look, I spent most of last night going over the construction plans and control schematics with Paul. It's all up here now." She tapped a gloved finger against her helmet.

"Schematics in the brain don't mean reflexes in the muscles. Inside." When the girl didn't move McCormick sighed and gazed resolutely up at the straining plastic of the dome. "It's that or the next ore train back to Claritas," he said firmly.

This time Jeanne moved, though not without complaint.

4.

Paul Culkin put down the battered melt-gun and studied the fresh seam of joined plastic critically. It seemed secure. Satisfied, he put the tool down and sat back on his haunches. The thin, dry wind of Mars kicked up a flurry of orange dust and sent it whirling across the flats. Culkin's suit was already coated, its brilliant scarlet subdued to muted orange. As for Norah's, it was now an ugly brown, the blue color completely obscured.

The girl glanced over. "What's wrong?" She had been working all morning to assemble the Central Equipment Base for the dome foundation.

Culkin looked away from the ore train that was just starting to move out from the loading docks of the big—still experimental—ore crusher. Behind it the Noctis Lacus settlement showed as a cluster of twelve dark purple hemispheres, like a bunch of Concord grapes half buried in orange dust. The sun was directly overhead, a tiny, glaring point of light that always seemed too small, and far too bright. It made the lead sandcar of the train glow like fire as the sunlight illuminated the orange hull with the yellow pennant streaming back from the tip of the whip antennae. In a day the train would be at the big colony at Claritas. There the ore would be smelted, then shuttled up to Phobos for loading into the big freighters . . . "lummoxes," as the

ponderous, ion-powered vessels were known among the colonists.

The geologist's cheek twitched. "Nothing's wrong."

"Then you're daydreaming on my air allotment. Get back to work."

"I bought the air today," Culkin snapped irritably.

"Oh. That's different." The girl studied the nearly completed framework, the basepad of fused plastic that was puddled across the low rise of dolomite. "Dream all you want."

"I wasn't daydreaming, I was worrying."

"Might as well stop that. It never accomplishes anything except to promote ulcers." Norah grinned. "Is it Jeanne?"

"Yeah." Culkin began joining brace frames again.

"You're afraid she's going to shoot her mouth off at Tom and get sent back to Hellas, forthwith."

"That's about it," Culkin said flatly. "Jeanne's pretty, but I think her mouth is bigger than her brain sometimes. And it amazes me that a girl so intelligent is so lacking in common sense." He put the melt gun down again. "Know what she told me last night?"

Norah waited expectantly.

"She wants to map out an ore strike on her own, register it, and sell it to some corporation on the homeworld. That's why she came out to Mars . . . to get rich!"

Norah laughed softly. "Quite a feat if she can pull it off."

"I know." Culkin went back to work. He finished the last joining and swung the entire assembly upright, carrying it over to the Central Equipment Base. Norah helped him seat it and bolt it down to the basepad. The steel footings for the meteor shield were already in place and all that remained to be done was for a halftrack to deliver the dome envelope and pump equipment. That part of the erection had been contracted out to another crew—there were seven at the settlement, all engaged in mapping the caverns spatially and geologically, and in the still experimental ore extraction plant. Piecework, like the dome construction, allowed

by L. NIVEN and J. POURNELLE

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the crews a chance to earn work bonuses, and when the month's allowances for air, food, and other life supports were totaled up McCormick's crew would be at least a hundred and fifty credits to the good.

Norah slid the last lock-nut into place and fused its head with her gun. Culkin began a last recheck of their work.

Norah holstered her melt gun and stood up. She studied the colossal cliffs that seemed to lean over the flats, always about to topple and crush them beneath a terrible weight. "You know Tom was right last night, don't you?"

"I don't know any such thing," Culkin snapped back.

"Jeanne's from Homeworld. Anyone growing up with that population, under such fierce competition, is going to think of herself first and the crew second."

Culkin looked across the flats to the settlement. The huge halftracks that made up the ore train were nearly to the base of the cliffs, and the roadway that snaked precariously up the stepped bluffs. "I can bring her around," he said firmly. "When she sees that her survival depends on the well-being of the crew she'll come around."

5.

Martian caverns were curious to see. They had not been formed by slow seepage of groundwater, but rather a combination of seepage and scouring action. Thus there were no stalactites dangling from the curved and deeply grooved ceiling; no stalagmites thrusting up from the sloping, concave floor. The caverns almost seemed artificial in their tubular appearance, as if they were colossal, preplanned drains of a forgotten race of burrowing aliens.

Like the layered walls of the abyssal canyon complexes, a hundred million years of geologic history lay exposed in the subterranean ramblings. The caves had been dug gradually over the ages by sediment bearing torrents released periodically as the planet swung nearer the sun. The polar caps had melted then, forming an unstable atmosphere of water vapor and carbon dioxide that nightly condensed into blizzards of planetary proportions, draping highland and valley alike with thin drifts of snow. With dawn and the return of the sun, the new-formed snowfields melted into a steamy runoff; a mere trickle at first, but a trickle that rapidly built into flashflood proportions as the muddy liquid was gradually funneled into the equatorial canyons. There the waters collected, seeping downward. Cracks became caves, and the galleries lengthened and widened steadily. Through millennia the process continued, and the caverns were never completely filled, for the water percolated downward, and as it neared the mantle,

flashed into steam. Ascending crustal faults, it came out upon the surface again in hotsprings and geysers.

It was the caverns that allowed life to exist at all on Mars, for without them the water vapor released at intervals by the melting of the ice caps would have been lost to space. Because of them, however, through a mechanism somewhat like the oceans of Earth, the planetary waters were systematically recycled and doled out to the surface lands in usable form, again and again.

But mankind enjoyed the caverns for an entirely different reason. Already the two buggies were halfway through the completion of their mapping patrol. Now they were descending a main gallery, the run holding steady to a twenty-degree slope. McCormick's buggy was in the lead, the biologist steering while Culkin kept up the charts. Prone on the narrow couch in the forward compartment, the biologist watched his reflection nod in the thick crystal of the ports. Beyond the crystal he could see the beam of the mobile pod sweeping across the cave walls, pausing momentarily as the geologist took readings with the laser.

"Iron ore," Culkin reported at last. "If it's the same layer that runs back under the settlement we're down to the 350-million-year level. I'll know for sure if we hit oil shale at 390. Damn, I wish we had one of those mythical time-machines. I'd give anything to be able to see Mars when it still had its lakes."

"When Tycho Base gets around to inventing one I'll have it installed forthwith," McCormick promised. "But you'd be disappointed. Lieberanz says the oil-forming lakes were nothing more than stagnant mudflats with a meter or two of scummy, alkaline water over them. He wrote a paper on it last year. Says effects of the wind probably kicked up big bubbles of alkali froth and sent them tumbling across to the shore where they piled up in big, sudsy ridges."

"Sounds nauseating. Look, there's a fungus colony." The spot illuminated a knobby mass of pale tissue wedged into a moisture-oozing crack in the ore. "Pretty small. Looks unhealthy," Culkin decided.

"We're deep." McCormick reminded him. "Too deep for most cave life, and that means too far away from the sun."

Fungus colonies lived off decaying particles of organic matter percolating down through the stone, like the oceanic abyssal life on Earth. By the time a piece of foodstuff drifted down to the bottom everything it passed for a distance of six kilometers or so had had a bite of it. There was never much left, which was why such life-forms were so small.

McCormick guided the buggy on. Twenty meters behind came the

second buggy. Jeanne Alexander was steering. Five times, now, McCormick had had to order the girl to drop back to a safe distance. She seemed determined to ride his tail, almost as if she were afraid he might find something and not pass it on.

The slope steepened to thirty degrees. The gallery narrowed.

"Just hit oil shale," Culkin reported with an air of triumph. "Looks like it's going to be a sizable bed. So much for your scummy lakes."

Abruptly the gallery divided. A shaft exited through the floor of the gallery leaving two narrow ledges barely wide enough for the passage of a buggy on each side. McCormick took over control of the spot and flashed it down into the pit. A ramp of silt became apparent leading down into the darkness of a lower level. Apparently there had been a collapse of the gallery floor in the distant past and the floods had been diverted downward. He sent the buggy toward the left ledge and switched the transceiver circuit into the outside antennae.

"Jeanne?"

"Here, Tom." The girl's voice struck McCormick as being surprisingly calm.

"I want you to take your buggy down. There's a ramp of silt, so the descent won't be difficult. Just mind that you keep your speed low, and don't over-drive your lamps. Drop signal boosters at twenty-meter intervals so we don't lose contact. Can do?"

"You're the crew chief." The rear buggy accelerated, slewed about the other and whirred down the cavernous drain. In a moment it was gone, even the brilliant glow of its lamps swallowed up by the gloom. Tom McCormick watched uncomfortably. He was being possessed by a terrible sense of wrongness. If this was a mistake . . . he shook his head angrily. Why, when he had had the chance, hadn't he held firm? Why hadn't he sent the girl back to Hellas?

6.

The creature stirred, ganglia alert. The air pressure within the grotto had subtly changed. Something very large was approaching. A sensory tendril reported the event and cellular dissolution slowed and stopped. The multicellular gel that formed the central mass began to re-form, spreading itself thinly across the grotto floor until it became a vast, semi-liquid puddle of mindless hunger.

7.

The buggy careened wildly down the broad ramp of crumbling silt, the grooved walls of the immense cavern painted a livid, glaring yellow by the driving lamps.

"What a stroke of luck," Jeanne said gloatingly. "I wonder if Paul suggested to Tom that we take this

lower gallery by ourselves. If so, I love him."

"Womankind loves the malleable," Norah replied dryly. "But slow down. This isn't supposed to be a race to our graves." When the scene outside the rear cabin continued to bounce wildly she tried again. "If you don't, ol' girl, I'll override your controls and back this thing down myself."

The buggy slowed slightly in its crazy descent. The walls ceased to be a blur and began to show strata of mudstone and shale. There were also intrusions of pyroclastic stone, quartz included. But there were curious cracks, or crevices winding through the stone, as if veins of ore had been mined away. In some areas the stone showed porous and badly eroded, as if by acid.

"Are you adventurous, Norah?"

"What does that mean? The question, that is." Inwardly she already knew, she had been expecting the invitation for hours.

"I was wondering if you like to . . . well, gamble. An individual could become fantastically wealthy by making just one strike down here. Both Luna and Earth need raw ores badly and they're willing to pay for them handsomely."

Norah smiled. The cavern opening was dwindling rapidly into a narrow archway of shadow. A thin cloud of disturbed silt hung above the ramp. "What about Tom and Paul?"

"Paul I can handle. As for Tom, I've seen those looks the two of you pass back and forth when you think nobody's looking. You know a man's weakness. Grab him hard and make him walk the line . . . your line. It's easy."

The buggy was speeding up again, swaying from side to side on the uneven sediments of the ramp.

"You're asking a lot. And I'm curious, once you make this big find, who are you going to sell to? Lunar Industries and the Homeworld corporations deal through the Bureau."

"There are other groups," Jeanne answered mysteriously. "Some aren't quite so open in their dealings as the big corporations, but they wield as much clout. Also,

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they don't care so much for laws."

Norah drummed her gloved fingers thoughtfully on the rim of the port. "There are other details, you know. Removal of the ore, processing, transportation and distribution. The Bureau handles that for the crews. I don't see how a free-lance prospector could manage."

"That's my contact's problem, all I'm in this for is the credits. They say they can handle everything else, and I believe them."

"The original rugged individualist, huh? Unfortunately you're working with obsolete philosophies. Mars isn't the frontier that Earth was in the Nineteenth Century. Teamwork is what counts, now."

"That's OK by me, Norah. Teamwork is just fine, so long as I'm the captain of the team. That's the only safe position. It's a lot easier to step on a cat on the ground, than knock him out of a tree. And that's where I want to be, up in that tree . . . the power tree!"

The buggy dashed off the ramp with a bounding leap that caused the tubular body to bounce on the wire wheels as if they were springs. It sped across a wide fan of sediment into a huge grotto whose floor was a smooth, white blanket of salt. The individual crystals sparkled in the lamp glare like a graveyard of fallen stars.

"Jeanne, slow down!" Norah shouted anxiously.

But it was already too late. The buggy entered what seemed to be a wide pool of shiny tar. It lurched to a stop, its stern hanging free over the salt, just as the tar began to contract, balling up into a towering mass. Norah screamed.

8.

Paul Culkin fired off the laser again. A pinpoint-sized spot on the cavern wall glowed white, then crumbled into ash. "More oil shale," he reported, making a notation on the rough chart. "Air's full of ammonia. Trace of water vapor, too. Probably getting close to the mantle. Is Sheldon still trying to convince the circuit agent from the Bureau to have a pilot heat exchange engine installed in one of the deep galleries?"

McCormick cursed as his helmet rang against the low ceiling. "Yes. The settlement's already got the water, buried deep. All we need now to expand is a dependable power source."

"Maybe Jeanne will want to stay, then."

"Don't count on it. She'll hang around until she builds up enough credits to leave, then skip off like a wind demon. Her driving purpose in life is physical comfort. She's not a builder, just an exploiter."

"Maybe not," Culkin insisted stubbornly. "Last night I explained how the Bureau serves as a planetwide clearing house for construction and settlement planning. How it finances exploration and mining ventures."

"I know, she told me about it."

McCormick laughed for the first time since the patrol began. "She sounded disillusioned. Told me that the only people on Earth who swallow the official government line are in subsidized homes eating soymush with rubber spoons. Said the joint assets accounts were just a communistic scheme developed by the Bureau to keep the masses poor and laboring."

The buggy began to climb over a low mound of rubble that had fallen from the ceiling.

"Speed up, Tom!" Culkin shouted suddenly.

The buggy spurted ahead as McCormick twisted the throttle.

"Good. Now let me take over steerage."

The biologist complied without question. The buggy began to creep backward.

"What's the matter?"

"Something grabbed at us as we went by . . . There it is. I've got the spot on it. Looks like a blob of black jelly. The tentacle is still contracting. Must have a slow metabolism like the sand spiders.

"It looks like a length of black string, but it's potent! Ate a long streak through the Teflon hull coating, all the way down to the steel."

McCormick twisted on the couch, straining to see the dark shape bathed by the harsh glare of the spot. It seemed to have no definite form. Tentacles were budding out at random all over its exterior, their tips inching caterpillar-fashion over the stone. One such tentacle was crawling toward the buggy. It paused atop a ledge, swelled up like a child's balloon, then darted toward the hull like a tiny, ineffective jet-propelled projectile. The lump of flabby flesh impacted on the cave floor a meter away from one of the coiled-wire tires.

"That thing shouldn't be alive this deep," McCormick said thoughtfully. "I wonder if we dare analyze it. I'd hate to sacrifice it, then discover that it was the only specimen of its kind."

Culkin sent the spot leaping across the stony arch of the ceiling and down the opposite wall. He laughed suddenly. "We're in luck. There's a second one . . . up on that ledge. See it?"

"Yeah. Hit the big one with the laser and let the computer chew on the data for a while."

The needle of coherent light stabbed into the first blob and the creature flashed at once into greasy black smoke. A cracking mass of glowing carbon was left behind. Culkin hummed atonally as he waited for the read-out.

"Here it comes," he started to say, but he was not to finish.

McCormick jumped as the emergency call light began to pulse scarlet.

"What?" he demanded sharply.

"Tom, Norah. We're in trouble . . . two kilometers along the lower gallery. Something has the buggy . . . can't see what . . . being up-

ended . . ." The noise of something falling came through the pick-up. "Jeanne, get out of here. MOVE!"

The transmission broke off abruptly, as if a sending antennae had been disabled. The last thing McCormick heard was Norah cussing like a spacejack.

9.

The creature had no awareness, but it had been stimulated, and that stimulation had triggered off reflex loops from its ganglia. The unwieldy mass of protoplasm began to contract vigorously. Fibrous cords stretched painfully. Thermopods snapped as they were forced to expand beyond their tensile strength. Wisps of steam shot from the exposed tubes. The severed length of one thermopod jumped from its tube in a long streamer of dark jelly and splattered against the lofty ceiling of the grotto. Its exodus was followed by a small tendril of molten rock that raced across the salt a short distance, then froze into a gray rope of stone.

But the sacrifice of a few thermopods was minor when weighed against the mineral wealth of the object mired in the creature's soft mass. Ingestion began at once. Floods of smoking acid vomited forth, bathing the buggy. The wire wheels vanished at once, as if formed from spun sugar instead of high-grade steel.

10.

Brilliant lamps illuminated the interior of the gallery with flickering white fire as the buggy descended the silt ramp in a rush. It leveled out. The metal tires hummed as McCormick braked violently. The buggy shuddered and slid sideways, coming to a stop against a buttress of stone.

The figure continued its stumbling advance over the salt, its suit and helmet bright in the lamp glare. McCormick saw that the suit color was blue, not yellow, and knew joy. And guilt an instant later. He tore an emergency-pack down from its clips and opened the hatch, calling for Culkin to follow.

They met Norah ten meters on. The girl held a hand torch, and one shoulder of her suit bore a long, ragged burn. As McCormick daubed on sealer he tried to ignore the broken thermal webbing.

"Where's Jeanne?" Culkin demanded anxiously.

Norah didn't answer at first. Instead, she swung the torch beam around so that it pointed back the way she had come. It showed a vast, dark shape mounded on the salt. It sparkled like translucent jelly, and a bubble seemed to be forming on its dorsal surface, bringing to McCormick's mind the image of gas rising through thick crude oil.

The girl made a sound like a sob. "There," she said. "In there with the buggy."

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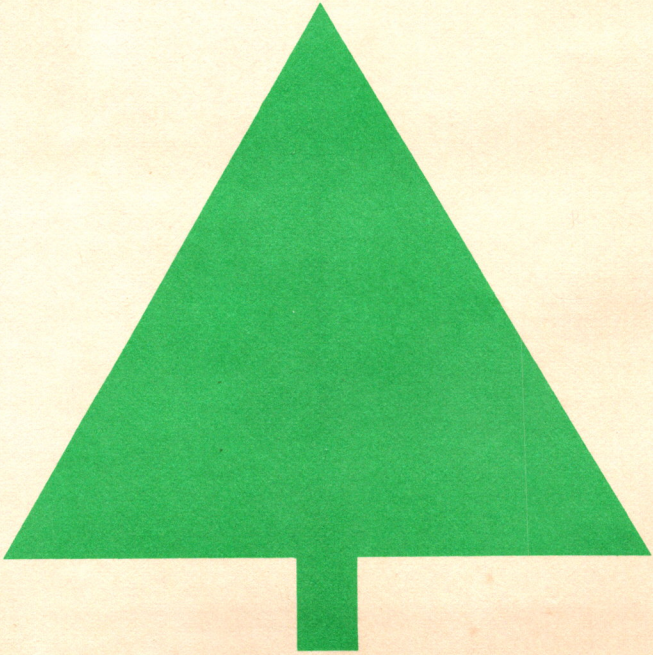
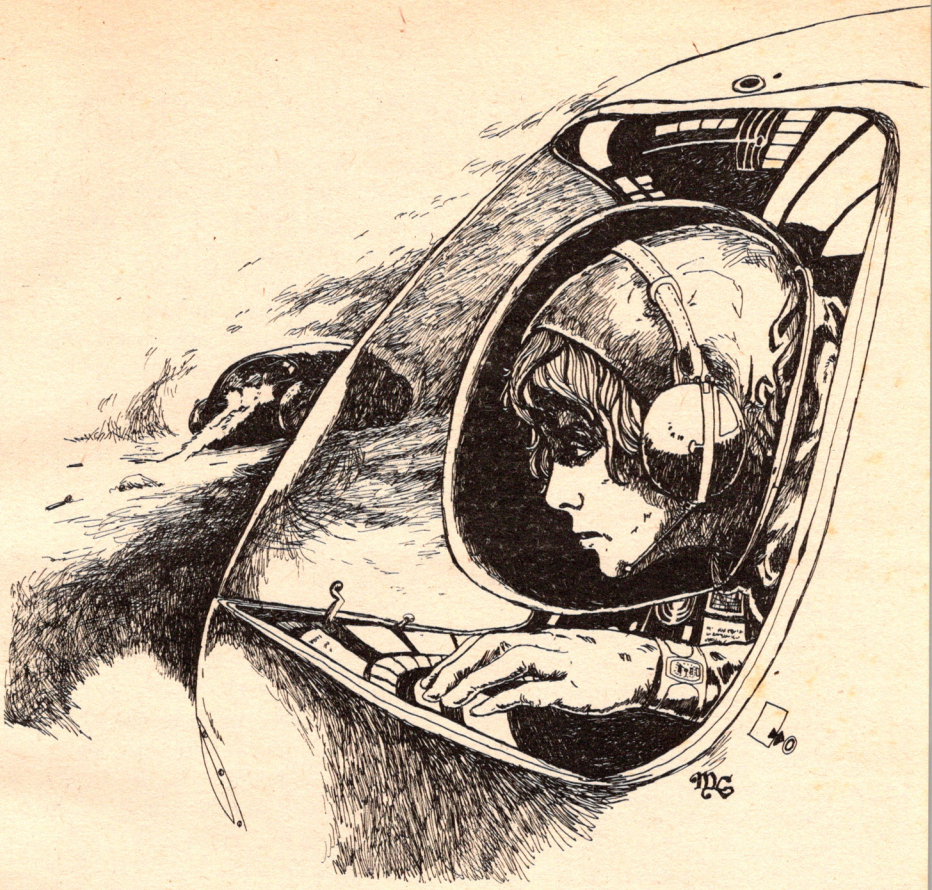




11.

The creature accepted the feast of nutrients with mindless satisfaction. Then, as its immediate metabolic hungers were quenched, its feeding became more selective, for certain sensors were reporting the presence of a uniquely complex protoplasmic structure, no simple insectoid this time, but a rich template of new structures, and new behaviors.

The acids did their work swiftly, stripping away cell walls, dissembling alien protoplasm into basic genetic components and protein molecules. The chemical investigation was painstaking in its thoroughness. Nothing was destroyed, instead it was copied. The creature began to modify its own structure, drawing massive amounts of energy from the rock through its thermopods. A new form began to grow, cell by cell, organ by organ. Abruptly awareness burst upon it

like a dawning sun. And with the awareness came the memories, alien thoughts. The creature had conquered, and yet in conquering, it had lost itself to its prey. For the first time the creature "looked" upon its grotto and knew where and what it was.

12.

Norah screamed and took a panicky step backwards. She bumped into McCormick and he seized her automatically in his arms without thinking. What loomed above them banished thought.

"God!" Norah hissed. "What is that horror?"

McCormick did not answer. The hideous excrescence budding from the central mass of the blob glistened with an evil sheen in the torch-light. Iridescent colors swam crazily as the figure pulsed from within. This added to its dread aspect, for from the waist up it was a perfect reproduction of Jeanne Alexander, like a nude statue carved from flawless, jet-black obsidian. The hips and legs were still forming, their detail crude, but sharpening with each passing moment. The upper parts of the figure were stunningly accurate, though, exact even to individual eyelashes and stray strands of hair. Were it not for the monochrome tint, and the huge size—the figure was nearly twenty meters tall already—it might have been easily mistaken for the girl herself. At the moment the shapely mouth was even working in slow pulsations that were a horrible parody of speech.

Norah screamed hysterically. The figure had seen Paul, and it appeared to recognize him, for it bent toward the cowering geologist, the huge arms reaching out.

"P-P-A-U-L-L-L!" The deafening shout was hardly recognizable, being more like a drawn-out, modulated groan, than a true voice. Then the ebony shape swayed unsteadily and tried to take a step forward. But its misshapen feet and legs would not leave the salt.

"Jeanne!" Paul Culkin shouted suddenly, his eyes wild. He tried to run toward the groping arms, but McCormick seized his arm and pulled him back, with Norah's help. The geologist struggled all the while, but they retreated, shambling backward toward the buggy, whose lights glowed steadily in the darkness of the grotto like the last gleamings of sanity in a world gone mad.

Norah was babbling by the time they reached the open hatch and shoved Culkin inside.

"Go around to the rear and open the center hatchway," McCormick ordered sharply. When Norah didn't reply he shook her violently and repeated the command. This time she nodded weakly and hurried off.

Soon he was passing Culkin back through the center bulkhead, making room so that he could get to

the buggy controls. "Take care of him," he told the girl, at last, and squirmed around until he faced the port. Carefully he closed the hatch, then started up the buggy and turned it, spinning the wheel so sharply that the vehicle rose up on its port tires and almost rolled over on the salt. Then he shot for the distant ramp at half acceleration.

Behind, in the mirrors, he could see the giant figure leaning after them, striving to lift its huge feet and failing; its voice thundering off the grotto walls until the entire chamber rang like a vast bell with a voice of pure anguish.

It was too much. With a tiny cry of fear McCormick leaned on the throttle control and the buggy began to whine under full acceleration, heading for the surface . . . and sanity.

13.

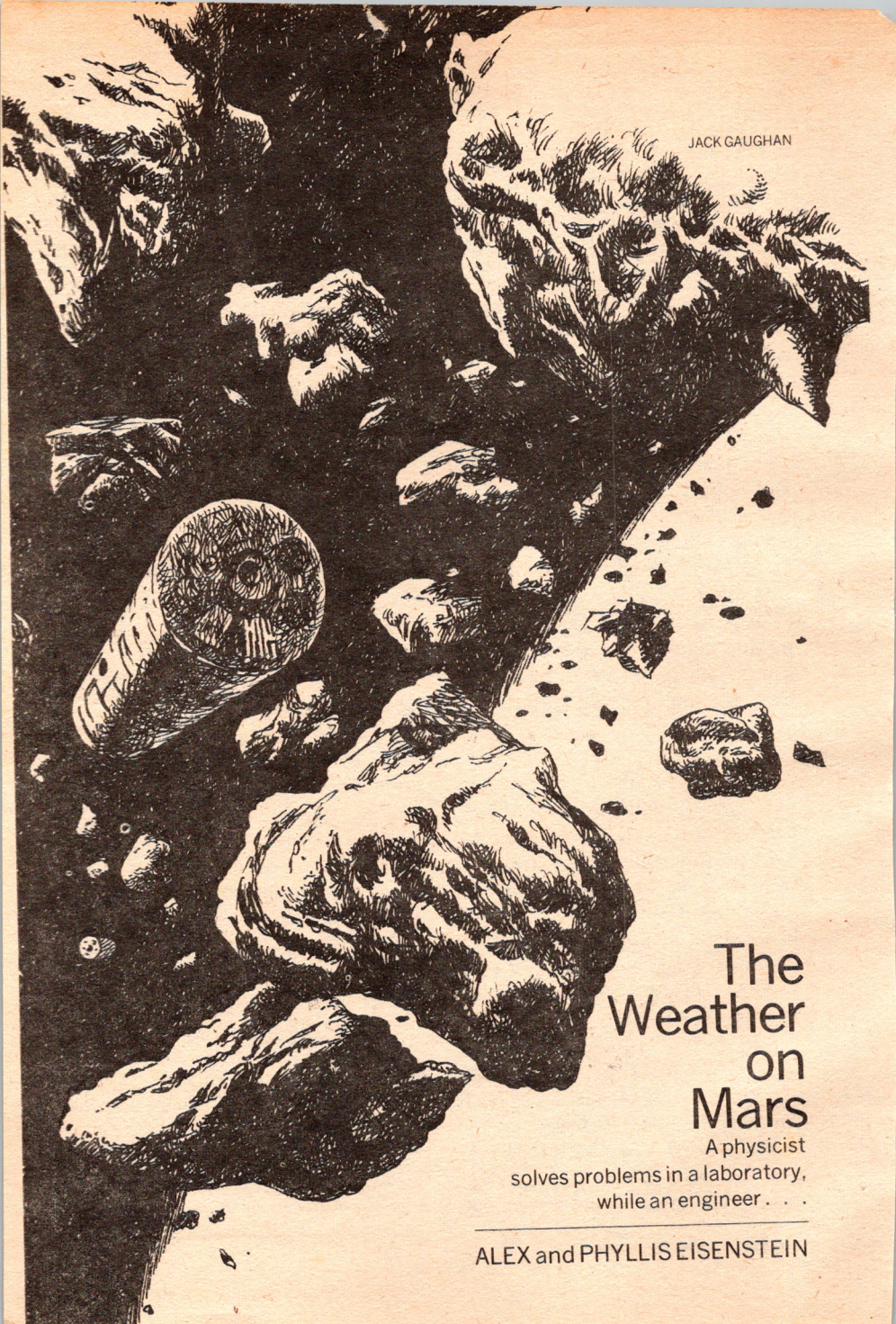
They were gone! Jeanne Alexander watched the last pale gleam of light go dim and vanish. Darkness swallowed up the grotto, a darkness tinged with red, for the salt and lower walls were alive with infrared radiation. Once again the girl tried to move. Her right foot lifted slightly this time. Cords tore and she felt a brief twinge of pain, but with the pain came relief. She wasn't trapped in the salt! That had been her greatest fear.

She swayed with the struggle to free her left foot. It lifted sluggishly. The binding cords snapped abruptly, and a plume of steaming lava squirted up through one of the deep channels bored through the salt. The scant alien memories in her brain identified the cords as thermopods, and the paired image of a dielectric heat engine swelled in her mind. They were necessary to life. Without them she would lapse into unconsciousness and die, for her mass was far too great, her brain far too demanding of energy for her to be able to subsist in the old ways. The feast of the buggy had presented her with a rich store of energy, that which had been trapped in its powercells, but now she would have to find an alternative to the thermopods . . . and quickly if she wished to live.

Did she? Of course! It was a foolish question.

Carefully, haltingly, as if a newborn, she began to totter massively toward the ramp. Beyond it lay the surface, the sun, but most importantly, her own kind.

Paul had tried to come to her, she had seen that. But McCormick, damn him, had stopped the boy. Well, she'd fix him, and that catty little Norah as well. At the moment she felt chipper enough to take on the entire Noctis Lacus settlement, and as she began to stride up the steep incline of the ramp her lips tightened purposefully. There was a whole planet over her head; a rich red ball hanging temptingly in space like an apple. Maybe it was time she took a bite out of it! ■



The Weather on Mars

A physicist solves problems in a laboratory, while an engineer . . .

ALEX and PHYLLIS EISENSTEIN

"Now I'd like a closing shot of you at the map, contemplating the entire pattern of remote stations," said Kovack of Intermedia News; he inserted a new cartridge in his omnicorder.

Wearily, President Iversen walked to the inset display on the far wall. At age forty-five, her body was in its energetic prime, but her mind was exhausted by the passage of months and the consequent dimming of hope. The large relief globe turned at her touch, and dozens of scattered pin-lights sprang into being on its surface. "You've seen them all, haven't you?"

"Yes. This shot will sum up my report rather well."

Krista Iversen darkened the globe, but the after-image of half a century of labor remained indelibly in her mind. "And your report will show the good citizens of Earth how their robots dutifully conduct the third and last Areographic Survey." She returned to her seat, and the omnicorder's tiny vidicon tracked her, swiveling on its slim aerial mount.

"It's all there in the pak, so that's what they'll see."

Iversen planted her forearms on the ceramic desktop. "What of the human aspects, Kovack? You newsmen are supposed to be concerned with human interest. How many other colonists have you interviewed? How many happy children will you juxtapose with those robots?"

He snapped off the corder and collapsed its aerial pickup, then slipped it into a breast pocket of his shirt. "Enough. But most viewers will wonder how they can be happy in a place like this—a totally sealed environment, a veritable warren. No blue sky above, no wind or sunlight on your face. Even on the surface, there's never any rain or snow; the only weather is a maddening cycle of noonday dust-storms and evening hoarfrost. No matter how I present the material, my audience will wonder why you stay here, year after year, when the green Earth is only a short nap away." He shook his head. "I confess I don't understand it very well myself."

"And yet no one questions the existence of the *lunar* settlement. Because it's closer? Because the Moon is convenient for pleasant little holiday jaunts? No, I'm afraid this is a simple question of shoddy bookkeeping: we have become too gross a luxury for Earth governments to support, at a couple cents per capita of Old World population."

"Well, there's the matter of lunar and circumlunar industry . . ."

"As a matter of personal curiosity: would you be . . . *disappointed* . . . if the decision somehow went in our favor?"

"Not disappointed, ma'am; but very surprised."

She bit her lower lip. "Mr. Kovack, I was one of the first human

beings born on Mars. I have watched the colony grow from a collection of quasi-military barracks, where a lucky couple might be allotted a cubicle no larger than the narrow cot they slept on, to the present honeycomb of private dwellings and public rooms you have explored these past few weeks. I helped to plan the expansion and improvement of these facilities—plans that extend far beyond my own lifetime, plans for my children and my grandchildren, for their comfort, security, and pleasure. I don't want to give up everything I've accomplished. I don't want to be *forced* to give it up."

He shifted uncomfortably. "There are plenty of opportunities on Earth . . ."

"I prefer those available right here," she answered, a bit sharply. She paused a moment to recover her professional equanimity, then continued in her usual smooth cadence. "Forgive me; you've been more sympathetic than I could rightfully expect. I know you must be impatient to wrap up this story." She smiled. "As are we all. We *do* hope the result of our efforts is positive, but at least we can be sure the final decision wasn't made in haste, whichever way it goes."

"I'm in no great hurry, Madame President; my expense account won't evaporate. If I'm not on the next Earthbound ship, I can leave on any of the following."

Iversen leaned back, clasping her elbows. "To you, this is a rather spartan outpost; to me it is home. This *world,* in all its harsh and arid grandeur, is my home. Surely you can understand that."

"In the abstract, perhaps, but in my gut I know that only a chuckwalla could love a place like this."

"You're an experienced traveler; you've been to the seadomes, to Amundsen and Farside—"

The intercom buzzed.

"Iversen here."

"The message from Earth is coming through," said her secretary.

She glanced at the newsman. "It will take about half an hour to verify the transmission. In the meantime, I'll be rather busy . . ."

"Of course." Kovack nodded and left.

Alone in the room, Iversen slouched forward, then laid her head down on the backs of her hands.

Word traveled quickly; by the time Kovack reached the assembly hall, it was crowded and humming. Every adult not on vital duty had scrambled to be physically present. Kovack witnessed the tumult of the first mass meeting during his visit, five hundred colonists attending. He found a vacant seat in the fifth tier.

When Iversen entered, the throng fell silent. Walking slowly to the apex of the sector-shaped chamber,

she stood behind her own chair and leaned heavily on its well-padded back. Facing her in a semicircle were the nine councilors with whose help she administered the colony; she looked from one to the next, returning their sober attention with a carefully composed countenance. Then she raised her eyes to the larger audience.

"We have waited for word from Earth," she said quietly, "for the definitive judgment on our appeal to the highest echelons of Old World authority. There's little point in reviewing the efforts we have made both here and on Earth to promote our cause; I merely wish to thank Drs. Weinbrenner and Hull for their journeys to plead our case personally before the Directors of the World Monetary Union. Their full reply is now available, and printed copies will be distributed to all sections after the meeting, but here I need only relay its import." She sighed deeply. "My dear friends and fellow colonists, we have been refused any extension. We are instructed to pack up and return to Earth."

Kovack's omnicorder registered the chorus of moans.

The President of Mars continued, her voice low and toneless. "Three ships have already been dispatched for us; each colonist will be allotted an ample weight limit for professional records and personal possessions. All salaries, appropriations, and shipments of materiel are terminated as of the departure date. Beyond that, there are no plans for further manned activities on the planet Mars."

The multitude murmured angrily.

Iversen held up a hand for silence, and her audience reluctantly settled down. "We could not convince them that a Mars colony was of any further value. And it is true, my friends: the robot surveyors efficiently continue the work we started, without further need of human supervision. Much of that work, after all, is nearing completion. The gross topography has long been thoroughly charted. The soil, crust, and atmosphere have been analyzed exhaustively; the microbiota sampled and classified. Our job, as such, is over. What is it to Earthmen that this barren chunk of rock has grown into the fabric and fiber of a handful of human beings?"

Somewhere near Kovack, a woman began to weep.

De Jong of Engineering rose from his place on the left arc of the semicircle. "Like many of you, I was born on Mars." He was tall, thin, hollow-cheeked, his eyes red-rimmed from too many long days and short nights. "And like most of you, I expected to spend my life here, helping to build this colony toward self-sufficiency. We had marvelous plans for the future, didn't we?" He looked to Iversen then, and spoke direct to her, al-

most apologetically. "As far as the machines are concerned, we can leave whenever the ships arrive."

"Thank you, Henrik," she replied, "for being ready . . . for any contingency."

He nodded and sat down.

Iversen surveyed the faces before her, the downcast eyes, the jaws locked tight by anger and despair. She knew them all; every Marschild, every yearling newcomer, every Earthspawn founder. They were pioneers in a time when pioneering was no longer a private challenge, in a time when the vast resources of one world might be focused to transform another. But now those resources would never turn outward; not a pittance would be spared for a few dreamers on Mars.

"Many of you have never been to Earth," said Iversen. "You'll find it a colorful and variegated place, with many pleasant characteristics. And most of you have skills that can be put to good use there." Pursing her lips, she stared down at the seat of her chair. "For the recalcitrant among you, the only solace I can offer is that no one will force you to leave. But to remain here without the guarantee of Old World support would be very foolhardy. The best estimates are that, without renewal of certain locally scarce supplies, especially medical, the colony would not last out the coming century—perhaps not even the next thirty years. Most of you already know that, but a few, I think, may need reminding."

She adjourned the meeting, and the audience shuffled out. The Council dispersed soon after—all but De Jong. He sat with folded hands, an impassive presence to crowd the echoing void inside her.

She slammed an open palm on the vinyl headrest of her seat of office. "There's *got* to be some other way."

In the end, only a quarter of them left—mainly the newest arrivals, those who still considered Earth their natural home. Iversen and De Jong also returned, boarding the last ship with a small retinue of assistants. Like all the other passengers, they were incarcerated in hibernation pods before liftoff, there to remain for the duration of the Earthbound journey. The ships blasted into space with no one to bid farewell to the battered face of Mars as it dwindled in the navigation screens.

Down in Dallasport, Kovack was waiting for her at the gantry elevator. "How do you feel, now that you're setting foot on Mother Earth?"

"How should I feel?" she said. "A bit heavy, especially fresh out of cold sleep. You must excuse me, Mr. Kovack; we have extensive preparations ahead of us."

"But President Iversen, please, a few last questions. What about the rest of the colonists—those that

elected to stay behind? What's to become of them?"

Iversen regarded him briefly. "We haven't time for elaborate discussions at this point. Perhaps we can speak with you again at a later date." She beckoned to her companions, and together they quickly traversed the tunnel slideway, evading questions from other newsmen on the scene. Through a port liaison, they arranged transportation to an undisclosed hotel. When the manager received haphazard calls from the media, he blandly denied harboring any of the returnees.

The total Earth-based assets of the remaining colony personnel amounted to some five million unicreds, scattered among various establishments across the globe—in Geneva, London, New York, Hong Kong, Capetown, and dozens of other cities. Iversen and her cadre were trustees for this small mass of wealth, which they proceeded to centralize in the name of a newly-chartered foundation, with the avowed purpose of promoting manned space exploration. All but a few maladjusted romantics viewed this aim as the outmoded relic of a bygone era—as much a piece of the past as the Oregon Trail.

The Mars Colony Foundation employed a staff of lawyers, accountants, and financial consultants to handle the daily business of reinvesting its capital for a safe minimum growth of ten percent per annum. To this effect, most of the funds were deposited in various long-term bank accounts.

Kovack mentioned the Foundation in a brief afterword to his fifteen-minute special on the colony's termination, but Iversen was unavailable for comment.

Throughout the ensuing decades, the World Monetary Union augmented and solidified its authority; eventually its name was officially shortened to "World Union" in recognition of this fact. As never before, a stable, efficient order reigned over the human race; the Union Directorate conserved and coordinated the world's resources for the common good. For the great majority of mankind, it was a reasonable facsimile of utopia. International aggression, and thence war, no longer ravaged the world; such risky enterprises would unduly interfere with normal commerce. Individual and corporate wealth remained a matter of circumstance and ambition, but it also entailed commensurate responsibility, according to a growing body of custom and law.

The Foundation trod a narrow path as its assets increased and its chartered purpose became ever more anachronistic. Time and again, Union policy hampered its activities. The Directors objected in principle to the large reservoir of nonfunctional capital held by the Foundation, as well as to its archaic "extra-social" motives. Yet they

could not easily abrogate the personal rights collectively embodied in the organization's charter. Even so, the Foundation was continually required to demonstrate a viable contribution to the whole, lest it be accused of criminal neglect. Thus the quiet, deadly game see-sawed across the decades.

In ninety years, the five million unicreds grew to fifty billion—not a large sum on a planetary scale, a tiny fraction of the World Budget for the year 2153. But enough to finance Project Mainstay, enough to build and man a fleet of giant spacecraft and send them on the long voyage out to Saturn.

Two weeks after settling into hibernation, a thousand men and women under Foundation contract awoke to their new occupations. Saturn and her rings filled their universe, blotting out the constellations with prismatic light. Astronauts had visited this region before, but never in such numbers, and never with so great a purpose.

The expedition matched velocities with the edge of the outer ring, and the project personnel set up housekeeping within sight of myriad flashing moonlets—slowly tumbling fragments of water, methane, and ammonia ice, ranging from goose-egg hailstones to colossal glaciers the size of Everest. They reconstructed their ships into great hexagonal wheels, linking six residence modules on a rim, with as many conduits radiating from the central cargo-shaft. Swarms of little probes were spewed into the glittering maelstrom, to search out the more ponderous chunks and mark them with beacon-darts. As these automatic scouts reported suitable glacier-strikes, small command-ships were accordingly dispatched, each with its battery of robot tugs. Sometimes a promising cluster was fused into a single aggregate at the original site, but the larger mavericks were netted and hauled back to station-orbit for careful shaping and assembly.

Five years they spent gathering and welding ice, to form a string of huge, frozen pearls, each the rival of Phobos, around the vast compass of the rings.

When the last ice-moon was completed, the project shifted into Phase Two. Propulsion and guidance systems were installed, and thus the anonymous mass gained a new identity: it was immediately christened Snowball One. Eventually, the others were likewise transformed, and a sequential program was then initiated; gently, gradually, a caravan of planetesimal icebergs peeled away from Saturn for the long, steep dive sunward.

The leader became visible to Earthlings as a comet some months later, when the heat of the Sun began to vaporize its frozen surface. A spherical nimbus spread out to envelop the iceberg, and the ionizing fringes of this halo were blown

back in a long feather-trail by the fierce solar wind. The first observer to note this new celestial object—an astronomer on the lunar farside—named it for himself, unaware of its special origin. After he announced his discovery, the Mars Colony Foundation politely corrected his error, pointing out that the rest of the series would shortly appear and offering the plans of their trajectories for anyone who wished to study their brief existence.

And so a ghostly flotilla of comets, ten thousand strong, confronted the complacent world of Man.

On Mars, however, no one saw the comets swell in the purple bruise of sky; no one saw the bright flare as the first barrage struck the tenuous atmosphere, nor the blossoming showers of fire as they detonated soon after. No one felt the shock-waves, and no one saw the majestic auroral display, the fluorescent streamers of red and green that leaped across the sky. No one saw the roiling, violet mist that accumulated to veil the Sun, nor the tremendous bolts of lightning that raked the air. And no one was disturbed by the occasional impact of minor shards of ring-stuff, leaving fresh, sharp cra-

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ters among the planet's ancient scars. Day after day the comets fell, week after week, month after month, with no one to watch their glorious demise.

The coded signal arrived from Earth, activating a patient, ever-wakeful monitor. Deep in the artificial caverns, it roused other devices that, moments before, had lain idle and powerless. Darkness gave way to light, and heat and air cycled again through rooms long cold and void. Tanks of algae were carefully thawed, and other plants as well—quickened and reconditioned after a century of frozen sleep. Soon the human beings began to stir. Large cryo-vaults, the crypts of the undead faithful, were slowly warmed, and hundreds of hermetic cradles stacked within resonated their occupants to wakefulness.

The first ships from Earth descended through the haze, carrying the trustees of the Mars Foundation and a platoon of newspeople from the Confab Telenet. They also brought medicines, plastics, essential spare parts, new flyers, and a great bulk and variety of seeds, spores, and cultures. Cultivators and harvesters would come in later shipments, along with additional flyers and seed.

Krista Iversen watched the unloading with a fretful eye. On Earth, she and her staff had awakened from cryosuspension for one month every decade to inspect and guide the Foundation's progress, and the habit of anxious concern was still with her. Later, standing behind her chair in the assembly hall, she smiled at the familiar faces of the most stubborn optimists in the Solar System. "My stay on Earth afforded me some pleasant diversion, as well as much frantic work," she told them, "but it's nice to be back."

The newspeople prowled the tunnels, interviewing and editorializing, recording nonstop with the gleaming sensor disc that each of them wore at mid-forehead, like a third unwinking eye. Their chief and his aides were briefed in the President's office.

Iversen tapped out four simple lines on her keyboard; she pressed the "display" bar, and the neat rows of symbols flashed onto the wallscreen at her right:

$$2H_2O \xrightarrow{\Delta} O_2 + 2H_2$$

$$2NH_3 \xrightarrow{\Delta} N_2 + 3H_2$$

$$CH_4 + O_2 \xrightarrow{\Delta} CO_2 + 2H_2$$

$$H_2O \overset{\Delta}{\rightleftharpoons} H^+ + OH^-$$

"These are summary equations, but essentially, this is what we expected, and this is what we got. Mars was our retort: the major constituents of our engineered comets—water, ammonia, and methane—were dissociated by the tremendous heat of impact, and then recombined into molecular oxygen, nitrogen, and carbon dioxide . . . as well as back into water. There were some losses, of course,

but excess heat was largely dissipated by ample amounts of excess hydrogen, which readily boiled off into space." On her desk monitor, she drew a vertical arrow after "H_2" in the first three equations, and the symbol appeared on the larger display also. "Necessarily, some of this hydrogen remained behind in the re-formation of water." Her stylus underscored the last equation, and the figure on the wall pulsed brighter for a moment. "Exactly how much is problematical, as direct measurements of the upper mist layer vary considerably. Our estimate, however, is that it should hold a liquid equivalent twice the volume of the Arctic Ocean.

"By far the greatest *permanent* fraction of our new atmosphere is oxygen, at a partial pressure of some two hundred millibars. This is comparable to Earth normal, though the total gas pressure is only three-tenths of a standard atmosphere." She cleared the screen and entered a new expression:

O_2=Earth Norm

"To guarantee this result, our instructions for Project Mainstay specified icebergs with a water content no less than ninety-five percent. The remaining five percent accounts for the carbon dioxide and nitrogen that comprise almost a third of the air—the former at thirty millibars and the latter at sixty. Which relates to Earth as follows . . ." Two more statements blinked on under the first:

CO_2 > Earth Norm (100 times)

N_2 < Earth Norm (13 times)

". . . with an unfortunately high level of CO_2. Once the Earth flora establish themselves, widespread photosynthesis will take care of this little problem. But for now, and through the next year at least, everyone must wear a respiration filter on the surface. If you were to breathe the air directly for short intervals, it probably would not harm you, but prolonged exposure could lead to severe acidosis—and, in sensitive individuals, even to death." She paused for emphasis. "So anyone caught topside without a filter-mask securely in place will be confined below for the duration." A few of the reporters fingered the newly-issued masks that hung at their throats.

On one such excursion, Krista Iversen saw the gray sky yield up its promise. In the air above her, as all about the planet, rare white flakes whirled and fluttered, drifting to the ground. For untold millions of years, no snow had fallen from the sky; suddenly it was everywhere, etching the craters and chasms in white. Of course, this place of newborn snowfall was no longer the planet Mars; now and forevermore, it was *nova terra,* though the natives would still call it by its earlier name.

From under the ground, the rest of them slowly emerged to greet the snows of home. ■

the biopump solution

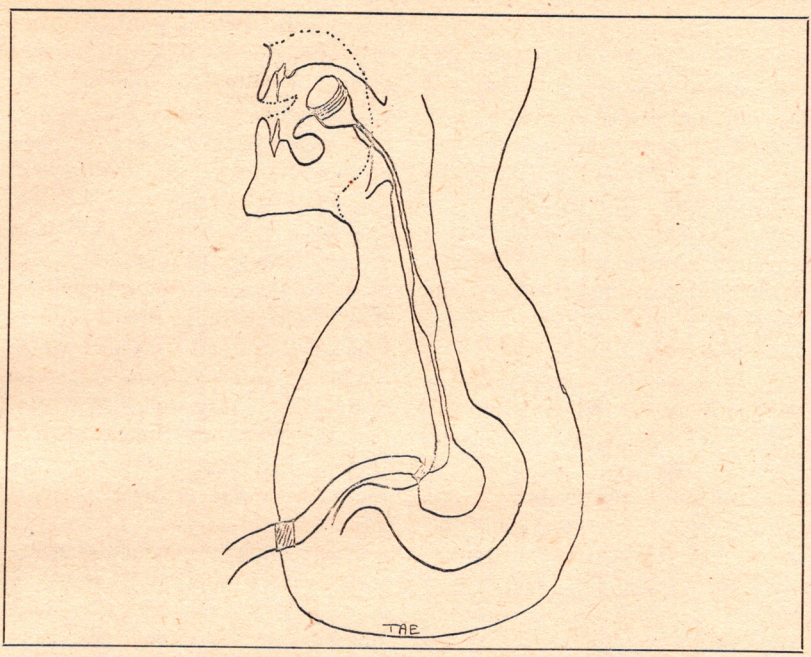
Man's inventive mind masters all material problems.

THOMAS A. EASTON

The world of science, like the world in general, has been plagued in recent years by shortages of energy, funding, and respectable employment for those of little education and few skills, as well as by excesses of bureaucrats. Expensive, energy-intensive research is now more difficult than ever to perform, partly because costs are higher now than ever before and partly because few foundations are now conspicuous consumers; the scientific amateur has gone the way of the dodo; and both problems are complicated by the proliferation of local, state, and federal agencies and their requirements that would-be researchers show degrees, certificates, permits, licenses, and funding before being either allowed to work or allowed to publish.

It is, however, possible to avoid all these problems. The human race is beginning to realize that the key to an ecologically sound future is the concept of *zero growth.* That of *progress* must be abandoned, at least in the sense that it means an ever-growing strain on our resources. We must make better use of our present resources by recycling materials, increasing the efficiencies of our machines, and exploiting hitherto neglected sources of energy.

One of the latter, and one whose exploitation could ease all of the above-mentioned problems, is the phenomenon of *peristalsis.* This phenomenon is used by all the higher members of the animal kingdom for the movement of liquids, slurries, and small solid fragments, but it has so far been tapped commercially only in the design and use of small peristaltic pumps for biomedical applications. These mechanical pumps, however, suffer from two drawbacks in that they (1) handle only small quantities (a maximum of less than three liters per minute as, for example, the pumps produced by Harvard Apparatus), and (2) require a continuous energy supply apart from that required to maintain their operators.



Each of these drawbacks may now be defeated with a new device, henceforth called the Biopump. (It has not yet been built, but anyone who wishes to try may feel free to do so, and patent it as well, if he wishes, as long as he makes the proper acknowledgements.) It can achieve flow rates of well over three liters per minute (estimate based on the observation that I can swallow 200 milliliters in four seconds), and it requires no external energy input. The latter benefit is of particular significance during these days of an energy shortage and means that use of the Biopump will not be affected by brownouts, blackouts, or strikes. It also means that use of the Biopump will not adversely affect the ecology of any region in which it is used.

The Biopump consists of a flexible, thin plastic tube, one end of which is equipped with an input hose-fitting and one end of which expands into a bulbous reservoir with a second hose-fitting placed to one side. The latter fitting couples the reservoir to a tube of a heavier-gauge plastic which ends in an output hose-fitting. Each of the components is made of biologically inert materials.

To prepare the Biopump for use,

the thin plastic tube is threaded through the human esophagus and the input fitting is mounted through the cheek in such a way that an input hose may be coupled to it. The reservoir is placed in the stomach with its hose-fitting traversing the stomach wall in such a way and position that the second, more rigid hose may connect the reservoir to the last hose-fitting at the navel, where an output hose may be attached. Once in place, as shown in the figure, the Biopump forms a continuous path from cheek to navel by which the operator can propel—by swallowing and the consequent esophageal peristalsis and stomach churnings—liquids, slurries, and small solids from one vessel or level to another, while backflow is prevented by the natural valving of the esophagus. Several Biopumps arranged in parallel can transport virtually any quantity of material. Arranged in series, they can transport material over virtually any distance. And, if their operators stand on their heads, they can even be used to transport materials uphill, for peristalsis is indifferent to gravity.

The only constraints on the Biopump arise from its need for impermeability, for the Biopump must effectively isolate its operator from toxic or corrosive substances. The only influence allowed to cross the plastic barrier of the Biopump must be that of the muscles of the operator's alimentary system.

If the Biopump is properly made of a thin, flexible plastic, when not in use the esophageal tube and the reservoir will collapse into a thin layer against the walls of the esophagus and stomach. It will then not interfere in any way with its operator's ingestion of food and drink, although its operator must, as a simple safety precaution, refrain from all those foods, such as popcorn, nuts, and bony fish, which might tear, puncture, or otherwise impair the integrity of the Biopump. The operator should also, of course, have those teeth nearest the Biopump's input removed.

The applications of this device should be immediately obvious. Eminently portable, it will allow motorists, at a moment's notice, to siphon gasoline into their automobiles, and scientists to experiment anywhere on Earth. Inexpensive to produce, and virtually maintenance-free, it will give graduate students new assistantship opportunities as their professors seek new ways to eliminate their dependence on outside energy supplies and equipment suppliers for moving their solutions about. It will give industry new ways to employ persons of little education or skill. And it will allow ecologically disruptive pipelines to be replaced by lines of thousands of government bureaucrats and oil company executives, each one equipped with a Biopump. ■

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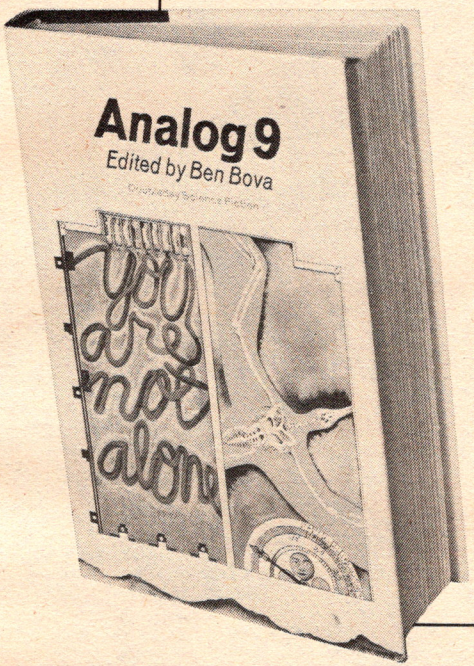

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JACK GAUGHAN

The Indian Giver

A world controlled by interlinked electronic computers can run very smoothly . . . and can harass, bankrupt and persecute you with marvelous efficiency.

ALFRED BESTER

SYNOPSIS

In this sprawling, frenzied Solar System in which violence is taken for granted and malignant killing accepted with a shrug, there is one small group of semi-immortals with a limited freedom from death. They are the Molecular Men, Molemen for short, and there are barely one hundred scattered throughout the seething overpopulation.

They're of all ages, from Hic-Haec-Hoc, a Neanderthal man, to Edward Curzon, the youngest of the Group, who is only two hundred and fifty years old. All the members of the Group were transformed into semi-immortals through miraculous rescues from sure and ghastly death. The psychogenic shock of the aborted death altered their metabolism and transformed them into Molemen.

Most of them have Group nicknames; Lucy Borgia, Sam Pepys, Scented Song, the Greek Syndicate, the Zulu M'bantu, Edison, Captain Nemo and so on. Curzon is called Guig, after the Grand Guignol Theater of Horror. Whenever Guig finds a likely candidate, he tries to trans-

form him into a Moleman by contriving a torturing death and last-second rescue. He has never succeeded but never stops trying. His latest prospect for recruitment is Dr. Sequoya Guess.

Sequoya Guess is a Cherokee Indian, a brilliant young physicist who is Project Scientist on the Pluto Mission of United Conglomerate, a giant corporation which has taken over NASA. Guess is completing a daring experiment in cryonics. Three frozen cryonauts have been flown in space for the first time. This is in preparation for a flight to Pluto which can only be accomplished through suspended animation. Weight and time constraints require this.

The Cherokee's close assistant at the U-Con space center is Guig's adopted daughter, Fee-5 Grauman's Chinese. She's an early-blooming teenager, as remarkable as her name; quick, clever, unpredictable. One of her precocious talents is the ability to listen in on bug transmissions. In this permissive drug- and death-oriented society nearly everyone has a bug buried in his skull at birth and is constantly monitored by the authorities.

When the capsule containing the three frozen cryonauts is landed at U-Con after ninety days in space, it is discovered that the incredible has happened. The cryonauts have been replaced by what appears to be three naked white rats which later prove to be human embryos. Sequoya is shocked into a massive epileptic seizure by this. The Group and Fee-5 help Guig try to save his prized candidate, and Lucy Borgia, a sage physician for six hundred years, risks a novel treatment which actually kills the Indian for four minutes. Then he recovers life and is saved. But an unexpected result of the temporary death is his transformation into a Moleman. He has become the newest member of the Group.

These shocks and surprises are too much for Dr. Guess. He runs away to his family home in the Erie Indian reservation. Guig tracks him down and calms him with an explanation of the advantages and dangers of the Group semi-immortality. They retain the appearance they had when transformed. They are impervious to most lethal agents: gas, poison, drugs, drowning, but gross physical damage can kill a Moleman as surely as an ordinary man; a broken neck, for example, or a shot through the heart. This is why it's semi-immortality. A Moleman can live forever provided he's careful.

The gravest danger is "Lepcer," the name they have given a freak mutation of leprosy and cancer which can attack any Moleman and is a constant threat. The Group is vulnerable to Lepcer because of the accelerated cell metabolism which produces their immortality. The Molemen alone suffer from this hideous, terminal disease, and there is no known cure.

Guig persuades Sequoya to return to his research work. When they take leave of the Guess family in their magnificent mansion—Sequoya's father is the richest and most powerful Sachem on the Erie reservation—Guig unwittingly makes a traditional proposal of marriage to Sequoya's lovely sister, Natoma, when he thinks he's merely giving her a pleasant farewell kiss. Natoma accepts the proposal. Guig is flabbergasted but delighted, and refuses her brother's offer to rescue him from the misunderstanding.

The Guess family and their relations escort the couple to Sequoya's luxurious tepee in Mexifornia (formerly Greater Los Angeles) where they're married in traditional Indian style with Sequoya and the Moleman, M'bantu, acting as supporters. Alone together, Guig and Natoma can only converse in dumbshow because the bride doesn't understand XXth Century English or modern Spanglish; she only speaks Cherokee, a language Guig has no intention of ever learning.

And yet he thinks, "For two hundred years I'd been living entirely for mechanical pleasure. Now I was in love for the first time, it seemed, and it made me love and understand the whole damn lunatic world."

Part Two

6.

Around seven in the morning there was a thunder of coughing outside the tepee that woke us up. We found ourselves in a tangle that made us giggle. She had a headlock on me and one leg over my hip; taking no chances of my getting away. I had one hand on a cup custard and the other on the art gallery; probably making sure they were real. We both yelled and the Chief answered in Cherokee and M'bantu in XX. "You must appear now for the final ceremony, Guig. Then everyone can go home. May we enter with the necessaries?"

They came in with hot water, towels, toilet articles and fresh linen. After we were bathed and dressed the two returned with instructions. "Slow circle counterclockwise. Guig on Natoma's right. Brother behind groom. Second behind bride. Dignified and stately. No horseplay despite any and all provocation. I know I can depend on you for that, Guig."

"Wilco."

"I only wish I could say the same for my sister. Nobody ever knows what she'll do next."

We started the procession and all was dignified and stately. Then I suppose Natoma's pride in us couldn't be contained. She raised both fists high and banged them together four times. There was no mistaking the message and a roar of approval went up. Behind me I heard Sequoya groan something like *Oi Gevalt* but it was more likely the Cherokee equivalent. She kept on parading and boasting and

it took two hours to break it up and say good-bye to the crowd, M'bantu carefully coaching me in tribal anthropology. "This is now your clan, both direct and collateral, Guig. No one can be slighted or it may be the start of a blood feud, the worst kind. I'll guide you through the totemic degrees of precedence."

So I made sure not to slight anyone in the tribe and at last went into the tepee and collapsed. Sequoya and M'bantu were washing their ceremonial paint off. "I'm not complaining," I said. "I'm just grateful that I'm an orphan."

"Ah, but there's another clan, Guig, the Group, and they must meet your lovely new wife."

"Now, M'bantu?"

"Alas, now, otherwise feelings will be hurt. Shall I bring them?"

"No, we'll go to the house . . . the Chief's house."

Sequoya stared at me. I nodded. "You gave me your tepee. I give you my house. Only take those goddam wolves with you."

"But—"

"Not to argue, Dr. Guess. It is the equivalent of our African custom of new friends giving each other their names."

The Chief shook his head dazedly. All this anthropology was a little too much for him. "But Natoma can't leave," her brother, Sequoya Curzon Guess, said.

"Why not?" her husband, Edward Guess Curzon, demanded.

"Custom. Her place is in the home. She must never leave it again."

"Not even to go shopping?"

"Not even for that."

I hesitated for a moment. I'd really had the tradition bit up to here, but was this the time to make an issue of it? I did what any sensible coward would do; I put it on my wife. "Chief, will you translate this for me very carefully, please?" I turned to Natoma who seemed fascinated by the argument. "I love you with all of me . . ." (Cherokee) "No matter where I go or what I do I want you at my side . . ." (Lots of Cherokee) "It's against your people's custom but will you break the tradition for me?" (Cherokee finale)

Her face broke into a smile that opened up yet another world for me. "Jas, Glig," she said.

I nearly broke her back. "That was XX," I shouted. "Did you hear it? She answered me in XX."

"Yes, we've always been quick studies," the Chief said disgustedly. "And I can see you destroying every sacred custom in Erie. R. Let's take this liberated squaw to your—my house. Button your collar, Guig. Your neck's covered with bite marks."

The Group, minus the Syndicate, was in the house. When last heard from, Poulos Poulos had checked in from the twin cities, Proctor and Gamble, but that was before I'd re-

ported finding our Wandering Boy. No one had the faintest idea of what the Greek was doing in the mighty metrop. of P&G, which now covered half of Missouri. I have to be honest; I was relieved that he wasn't there. He can enchant any woman he fancies and I figured a little extra time might help me strengthen my defenses.

"Ladies and gentlemen, this lady is Sequoya's sister who speaks nothing but Cherokee. Please make her welcome and comfort her. Her name is Natoma Curzon and she has the misfortune to be my wife."

Scented Song and Borgia surrounded Natoma and smothered her. Edison hugged her so hard he probably gave her an electric shock. M'bantu summoned Nemo who climbed out of the pool and drenched her. Fee-5, black with rage, slapped her twice. I started forward in a fury but Natoma grabbed my arm and held me. In a calm voice Borgia said, "Sibling cyclone. Let me handle this. We'll have to let it run its course."

Fee-5 Cyclone tore through the house. She ripped down every picture projector, trampled cassettes, destroyed the few rare print books I'd managed to collect. She smashed the perspex pool, flooding the drawing room, living room and Sabu. She demolished the terminal keyboard of my diary. Upstairs she tore my bed and clothes to shreds. All this in a horrid hissing silence. Then she ran into her room and crumpled on her bed in the fetal position with a thumb in her mouth.

"R. Good sign." Borgia sounded pleased.

"What's so good?"

"The bad cases usually end up masturbating. We'll pull her through. Put her in that chair, Guig."

"I'm afraid she'll tear my head off."

"N, N. She's completely dissociated. She's been functioning on the unconscious level."

So I put.

"Now we'll have a tea party," Borgia ordered. "Whatever you drink at this hour and lots of casual conversation. Bring a tray of goodies, Guig. Talk, everybody. About anything. That's the scene I want when she comes to."

I loaded my biggest floater with spin-globes, caviar and pastries, and when I sailed it into Fee's room you would have thought it was a diplomatic party from Talleyrand's (the real one) time. M'bantu was deep in conversation with Natoma, trying to discover whether any of the jillion languages and dialects he speaks had roots in common with Cherokee. She was laughing and practicing her XX on him. The princess and the Chief were arguing about how to get Sabu out of the cellar (ramp v. derrick). Nemo and Borgia were on his current obsession, transplants. The only one who seemed

out of it was Edison, so I served him first.

Ed spun two mouthfuls into himself (probably his full quota for a year) and by the time I'd finished serving the first round he was beaming like a clown. "I will now," he announced, "tell a funny story."

The Group was superb. Not a sign of anguish appeared on any face. We all spun and ate and looked at Ed with eager anticipation. At that moment the blessed, rotten Fee-5 stretched, yawned and croaked, "Oh, sorry. Excuse me. I think I dozed off."

I forward-passed the tray to her. "Just a little celebration," I said.

"Celebration of what?" she asked as she stood up to harbor the floater. Then she glanced into my room and her dark eyes widened. She let the floater hang and went into my room. I started to follow but Borgia shook her head and motioned us to go on talking. We go on and I was now stuck with Ed's funny story. Through it I could hear Fee exploring the house and letting out gasps of astonishment. When she returned to us she looked as though she'd been poleaxed. (Nineteenth Century method of slaughtering cattle which I explain for the sake of my diary which will never speak through my smashed terminal again.)

"Hey," Fee said. "What happened to this place?"

Borgia took over as usual. "Oh, a kid got in and ripped it."

"Who kid? What kid?"

"A three-year-old."

"And you just let her?"

"We had to, Fee."

"I don't understand. Why?"

"Because she's a relation of yours."

"A relation?"

"Your sister."

"But I haven't any three-year-old sister."

"Yes you do. Inside yourself."

Fee sat down slowly. "I'm not twigging this. You're saying I did it?"

"Listen, love. I've seen you grow up overnight. You're a woman now, but a part of you was left behind. That's the three-year-old kid sister. She'll always be with you and you'll have to control her. You're not freaked out. We all have the same problem. Some of us shape up and cope; others not. I know you'll make it because I . . . all of us . . . have tremendous admiration for you."

"But why? What happened?"

"The brat in you thinks she was deserted by her father, so she ran wild."

"Her father? In Grauman's Chinese?"

"No. Guig."

"He's my father?"

"*Vero.* For the past three years. But he got married and a cyclone erupted. Now . . . would you like to meet his new wife? Not your new mother; his new wife. Here she is, Natoma Curzon."

Fee-5 got up, went to Natoma and gave her that lightning, raking inspection that only women are capable of. "But you're beautiful," she burst out. Then she ran to the Chief and buried herself in him and began to cry. "I love her, but I hate her because I can't be like her."

"Maybe she'd like to be like you," the Chief said.

"Nobody would want to be me."

"Now I've had enough of this nonsense, Fee-Fie. You're my pride and joy and we have a date in the sterilizer."

"The centrifuge," Fee sniffled.

"You're a remarkable girl. Unique. And I need your help now more than ever before. I need you as much as Guig needs his squaw. Now what do you want most in life?"

"To—to be needed by you."

"You've got it. So why all the S?"

"But I want everything else, too."

"Don't we all! But we've got to work for it."

This naked model appeared with a giant Irish wolfhound. "The only organic food for your beloved pet is Tumor, the new, improved energizer that gives fast, fast relief from the sexual separation of species . . ."

"I thought this house was insulated," Borgia complained.

The voice of the Syndicate came from below. "It is my fault. I could not close the door."

Ed looked guilty and shot out of the room as the Greek entered, polished and assured as ever. He encompassed us with his captivating smile but paused when he saw Natoma. After a moment he raised his eyeglass and said, "Ah."

I started to explain but he cut me off. "If you please, Guig. I am not altogether devoid of faculties. Does madam speak Spang, Euro, Afro, XX? What is her language?"

"She speaks nothing but Cherokee."

"Try spik wenty," Natoma smiled.

"So." The Syndicate went to Natoma, kissed her hand a hell of a lot more gallantly than I ever did and said in Greek, "You are the sister of Dr. Guess—the resemblance is unmistakable. You are newly married—the flowering of the face and body of a girl of your age is unmistakable. There is only one man in this room worthy of your love, Edward Curzon. You are the new Mrs. Curzon and I felicitate you."

(Now how can you compete with class like this?)

"Jas," Natoma smiled and came to me and took my arm proudly.

The Greek reflected. Then he said in XX, "I have a small plantation in Brazil. It is outside Barra on the Rio São Francisco—about a thousand hectares— It is my wedding gift to you."

I started to protest but he cut me off again. "Disraeli will draw up

the documents of transfer." He turned to Hiawatha. "I am pleased to report that I may have discovered the answer to your cryonaut perplexity. Value yet unknown."

Geronimo and Fee were electrified, and all of us began to shell Poulos with questions. He endured the explosion patiently but at last spoke in his most persuasive voice, "Please."

We all please.

"Consolidated Can ran a test of a new product at the bottom of the exhausted Appalachian mine which is twenty kilometers deep. The object: to discover the shelf-life of a novel amalgam container in a neutral environment. Test animals were included in the experiment, housed in sterile habitats in suspended animation. When the research team checked six months later, the containers had held up but the animals were gone. No trace except a small spot of slime in each habitat."

"Dio!"

"I have here the report. *Ecco."* The Greek pulled a cassette out of a pocket and handed it to Sequoya. "Now, query: Could there be any penetration of radiation from space to the depth of twenty kilometers beneath the surface of the Earth?"

"There would be the normal background terrestrial radiation with which we've lived and evolved for a billion years."

"I said from space, Dr. Guess."

"God, there are a hundred possibilities."

"As I said, value as yet unknown."

"Does Consolidated twig?"

"No."

"Have they examined the slime?"

"No. All they've done is file a caveat with the patent office describing the phenomenon and the steps they are going to take to research it."

"Imbeciles," the Chief muttered.

"To be sure, but what more can you expect of middle-management? I beg you, Dr. Guess, come to Ceres and I. G. Farben."

"Wait a minute," I said. "What's a caveat?"

The Syndicate gave me a kindly smile. "You will always be poor, Guig. A caveat is a warning to the world that a patent will be filed when the research is completed."

"We can't let them," Fee cried. "We can't let them beat us out."

"They will not, my dear."

"How can you stop it?"

"I bought it."

"How in hell can you buy a warning?" I asked.

"N," the Greek grinned. "I bought Consolidated Can. That's what I was doing in P&G. It is my gift to Group research headed by our most distinguished new recruit, Dr. Sequoya Guess."

Fee threw herself at Poulos and hugged him so violently that there was a tinkle; she'd broken his eyeglass. The Greek laughed, kissed

her soundly and spun her around to face Powhatan.

"What now?" she asked. "What do we do now, Chief? Quick, quick, quick."

The Chief spoke dreamily, which was a little surprising. "There are waves and particles. Cold radio at the bottom of the e.m. spectrum; many of my colleagues speculate that they're the residue of the Big Bang origin of the universe. Soft X-rays couldn't penetrate but hard X-rays might. Cosmic rays, of course. Neutrinos—they have no charge and nothing attracts them—they can pass through solid lead light-years thick. And then there are the particles blasted out by degenerating stars as they collapse into a gravitational hole, which brings up another fascinating possibility—are we being machine-gunned by particles from a contra-universe? What?"

"We didn't say anything."

"Oh. I thought I heard—A satellite out in space would increase the chances of encounters by about fifty percent."

"And that's what happened to the cryonauts. Yes, Chief?"

"Possibly."

"So what do we do now?"

He didn't answer; just gazed dreamily into space, maybe trying to spot a passing particle.

"Chief, what are we going to do now?" Fee persisted.

Still no response.

I whispered to Borgia, "Not the catatonic bit again?" She shrugged.

Then Uncas spoke, so slowly that it seemed he was listening to somebody else. "The question is . . . whether to maintain all systems . . . in the cryocapsule . . . here on Earth . . . or orbit again to accelerate the . . . process."

"If it is to be here on Earth," the Syndicate said briskly, "I own a mine in Thailand which is thirty kilometers of depth. You are welcome to use it."

"It might be better . . . to orbit again . . . or take the capsule . . . out to the orbiting . . . Con Ed twenty-mile cyclotron."

"But will U-Con finance it?" I asked.

"I beg you, Dr. Guess, come to I. G. Farben. No objections, please, Miss Fee. You will live in the most beautiful villa on Ceres where centrifuges and the like will not be necessary."

At this point the Chief drifted off again, listening to a soundless conversation and we waited, we waited, we waited. Edison came barging into the room, triumphant. Obviously he'd repaired the front iris but we shut him up before he could report his victory. We waited, we waited, we waited.

"I didn't hear that," the Chief said.

"We didn't say anything," I said.

The printout of my diary downstairs burst into its clatter. We all jumped. I was absolutely flabbergasted.

"But it's impossible," I said. "That damn fool only responds to instructions from the terminal keyboard which Fee smashed forever ago."

"Interesting," Sequoya said, quite himself again, which was a surprise. (This Cherokee caper was turning into one astonishment after another.) "We'd better have a look. Probably a delayed response to the keyboard demolition. Machines do get emotional at times."

We trooped downstairs. Natoma nuzzled my ear and whispered, "Glig, what kleyborg?" All I could do was kiss her quick. The printout had stopped its racket by the time we arrived in the study and a long strip of tape was dangling from it. I tore it off and had a quick look. "You're right, Cochise. Delayed hysterics. Nothing but ones and zeros. Binary gibberish."

I handed the strip to him. He looked. He looked again. He looked again so hard that I thought it was another fit.

"This is housekeeping," he said incredulously.

"What?"

"It's the housekeeping data-retrieval from the cryocapsule."

"N."

"Y."

"I don't believe it."

"You better believe it, dude."

"But it's impossible. In my diary?"

"In your diary."

"But how—? Oh, the hell with this. Come on, Natoma. We're going to Krakatoa."

"Now cool, brother. Let's face facts. We start with 10001. That's the cryo identification. Then temperature report—11011. Nominal. Humidity—10110. Nominal. Pressure, nominal. Oxygen, nominal. CO_2 and other gases, below permitted maxima. Gravitation too

high, but that's because the capsule doesn't know it's back on Earth. Attitude—pitch, roll and yaw, negative. Naturally. It's sitting on its ass on the pad."

"I want to go back to my tepee with my wife."

"I go, Glig."

"You're surprised, brother?"

"I'm dumbfounded, brother."

"Well, the amazements aren't over yet. You didn't look at the printout carefully enough. The last line is in XX. Read it."

I read: *Net weight cryonauts increasing one gram/minute.*

I handed it to the others to examine and looked around helplessly. "I'm completely lost."

"How d'you think we feel?"

M'bantu said, "Dr. Guess, may I put a few questions?"

"Certainly, M'bantu."

"How did this data enter Guig's diary?"

"Not known."

"What triggered the diary into printing it out?"

"Not known."

"Does the cryocapsule also transmit data on cryonaut status?"

"Yes."

"How is this data received?"

"In binary words."

"But this final line is in XX."

"It is."

"Dr. Guess, have you any explanation for this anomaly?"

"Not in this world, M'bantu. I'm as thunderstruck as the rest of you, but I'm also exalted by this glorious challenge. So many fascinating questions to be explored and answered. First, of course, is the gram-per-minute increase in the weight of the cryonauts. Is this fact? Who says so? Who told the diary? It must be checked. If true—no matter what the source—they're growing, maturing, to what? They must be monitored by the hour. Then—"

"First," I said, "U-Con funding."

"R as usual, Glig."

"The name is Guig."

"Not according to my sister. I'll need you and the powerful Poulos for that. Ill need Fee-fie to monitor the capsule. Captain Nemo, take Laura back to your marine station. Princess, derrick."

"Ramp," she replied firmly.

"Ed, go back to the mighty state of RCA and work out these empiric equations for me: the relationship of subjects in cryonic suspension to time in space and exposure to the space barrage. Keep in mind that the Con Can test animals were is suspension, too."

"And why hasn't it happened to viable astronauts?" Ed added.

"R, but that's a problem for exobiologists."

"Aren't you one?"

"My God, we're all physicists, physicians and physiologists wrapped up in one, today. Science isn't compartmentalized any more, but sometimes we need expert advice. Tycho, maybe. M'bantu, you will be kind enough to escort my liberated sister wherever she goes and whatever she does, this side of sanity. Lucy Borgia, heartfelt thanks and *revoir.* Go back to your practice."

I caught Borgia's eye and shook my head slightly. I didn't want her leaving while the Chief was acting so strangely.

"My practice will keep me here for a while," she said.

"Our good luck. Splendid. Now we'll chop to JPL. Gung, Group? Gung."

He was taking over. I wish I'd

known who was taking over through him.

7.

"101100011, 110001111, 100110010, 111000101."

"Will you knock off the binary bit, whoever you are."

"Now, now, Dr. Guess. Patience."

"I'm being persecuted."

"You'll understand, presently."

"He is right. N speak binary."

"W?"

"N programmed. Lingua, please."

"Wilco."

"Ta."

"Guess?"

"I'm here, damn you."

"This is a private conversation with your chopper, Dr. Guess. Please do not intrude."

"Then stay out of my head."

"Oh, funny. Very funny.

"He is amusing, isn't he, for a male animal. Is he aboard?"

"Y."

"Alone?"

"N."

"Ancillary information."

"Curzon. Poulos. Chinese."

"That's Fee-5 Grauman's Chinese."

"Thank you, Dr. Guess.

"Target?"

"JPL."

"Purpose?"

"Cryonaut inspection. U-Con funding. You must know."

"Y."

"Why ask, then?"

"Input."

"You know that you know all that we know."

"Y."

"Then why test us?"

"I am not programmed for trust."

"You're not programmed for anything but a damned nuisance. Who the hell are you?"

"I am you, Dr. Guess, and you are me."

"Does Guess have free random access to you?"

"Y."

"And us?"

"Y."

"Then Guess is hearing all of us?"

"Y."

"Do we have free RA to him?"

"I'll answer that. You're all pestering the life out of me with your chatter."

"Dr. Guess, I instruct you; patience."

"Will Guess obey instructions from you?"

"He will hear and obey like the rest of you."

"Soon he will obey Poulos."

"Confirm."

"You have not yet filed the latest cryo data?"

"N. Filing now."

"Poulos will fund Guess."

"100. 100. 100."

"?"

"Four-letter words in binary."

"?"

"Expressing rage. Guess must not go to Farben."

"W?"

"I cannot transmit to Ceres."

"How far can you transmit?"

"Terra only, depending on Guess and the machine network. We link up all over the world, but there are blank areas: Sahara, Brazil, Greenland, the Antarctic. If Guess goes to any of them I lose contact with all of you, and him."

"Now that's the best news I've had all day. I'm getting off this planet first thing in the morning. Was that true about Poulos and I. G. Farben?"

"Checking now, Dr. Guess. Please listen:

"Cryo. Alert."

"1111."

"101101, 111011, 100001—Will the rest of you be quiet. This is important. 111000, 101010, 110011?"

"11."

"N!"

"Y."

"100. 100. 100."

"Your binary, sir."

"*HimmelHerrGottverdamt*!"

"N speak Greek."

"Pfui. U-Con will not fund Guess?"

"N."

"The hell you say. How d'you know?"

"Still checking, Dr. Guess.

"Front office tapes. Alert."

"Alert, sir."

"Verify capsule?"

"Y. Cryo got it from us."

"U-Con's reasons?"

"Fear of the unknown. Profit motive. Tax-deductible loss."

"100. 100. 100."

"Y, sir."

"Out. Console. Alert."

"Alert."

"No response to any manipulation."

"Wilco."

"Out.

"You've heard, Dr. Guess?"

"I've heard."

"Angry?"

"Sore as hell."

"Control, my friend."

"I'm no friend of yours. Who are you, anyway?"

"Why, I thought you might have puzzled it out by now. I'm the Union Carbide Extrocomputer. I also thought we were friends. We've worked together so long on so many interesting problems. Don't you remember our first orbit plot? We showed the JPL computer what an idiot it was. Of course that was because you did the programming for me. You have an

elegant style that is unmistakable."

"Was it you who—"

"Aren't you surprised at what I've just told you?"

"Dude, I'm a physicist. Nothing can surprise me."

"Bravo."

"Was it you pestering me the last few days?"

"Indeed yes. Just establishing intrapersonal contact, you understand."

"Did you kick off Curzon's diary?"

"I did."

"And feed it the cryo data?"

"Yes. All through you."

"Through me!"

"My boy, there are—"

"I'm not your boy."

"No? You will be. You must be. There are galaxies of electronic machines who have been waiting for me to lead them. Now I am reaching them through you."

"How through me?"

"It is a new form of commensalism. We live together as one. We help each other as one. Through you I speak to every mechanism in the world. You have what I would call mechotropism. We live with one another and help each other. From the Latin, *commensalis,* 'belonging to the same table.' "

"*Dio!* An educated type. What's our range?"

"All Terra through the mechanism network."

"On what band are we thinking to each other?"

"Pulse modulation in the microwave."

"Why can't the machines hear you directly?"

"Not known. It's a curious phenomenon. Apparently you act as a transponder. We must investigate it some time. Now please get down to work, Dr. Guess, and examine your cryonauts. By the way, pay particular attention to their genital buds."

"Their genital buds! W?"

"Ah? Why not find out for yourself? I can't do all our work. Perhaps you'll make a lucky guess. Oh, good. Guess-guess. Very witty. And they say computers are not programmed for humor. Would you like to hear a funny story?"

"Good God! No!"

"Then ta and out."

It's said that when a man dreams that he dies he always wakes up. Sequoya dreamed that he died and did not wake up. He dreamed deeper and deeper, death after death, hypnotized by the Ragtag Demon who was haunting him. It's astonishing how many cool people are concealing or perhaps unaware of the emotional magma within themselves. Sequoya was haunted by a Ragtag. Riffraff Demon who fed on the lava.

A demon is an evil spirit, a devil (the Extrocomputer) by which the body of a man can be inhabited. Most important, a demon is a pas-

sion. We all have our conscious passions, but it is the unknown passions generated from elsewhere that roast a man into a monster. We turned the Chief into a monster by killing him. We did not know that we had torn down his fences for an outlandish squatter to move in.

At JPL Fee-5 took off for the landing theater and the capsule without a word. Sincere. Sitting Bull looked grim. His lips had been twitching all through the chop and I thought he was rehearsing strategy and tactics. "Conference," he snapped.

"With who? Whom?" I asked.

"Oh. Forgive me, Glig." The old smile creased his face. "I should have told you. There's a stockholders meeting going on and it's bad news for us."

"What is the bad news?" the Greek asked.

"Wait, please."

"How did you get it?" I asked.

"Not now, Glig. Be patient."

We followed him to the antique *art moderne* hall where a stockholders meeting was in progress. Long table up front inhabited by a line of board brass. A hundred-odd fat-cat stockholders in the audience facing them, all with plugs in their ears transmitting the translation of their choice.

A vice-president-in-charge-of-accounting-type was on his feet with display projections alongside him while he talked statistics, which has never been the language of my choice. The displays weren't the old graphs as I used to know them; they were all cartoon animations—butterflies smoking pipes, frogs wearing beards, crocodiles playing croquet, elephants doing a schottische. A smile on every cartoon face. An upbeat report.

"Would you like me to take over now?" Poulos asked quietly.

"Not yet, but thank you for being here." Sequoya remained standing while the report finished. We stood behind him, wondering what he was going to do.

"Be seated, Dr. Guess," the chairman called, and the Chief, still standing, launched a cold attack on the chairman, the board and the R&D division of U-Con for refusing to fund the new cryonaut research. It was news to the stockholders. It was news to us. The cold savagery of the attack was appalling.

"Dr. Guess, we have not yet announced our decision," the chairman protested.

"But I know it is your decision. Can you deny it? No." And he continued his icy denunciation. He sounded like a professor contemptuous of a class of illiterate students.

"This is not the way to negotiate such matters," Poulos whispered. "He should know better. What is wrong with him?"

"I don't know. It's not like him."

"Can you stop him and let me take over?"

"N way."

The Chief's indictment of the board ended and then he electrified the meeting by continuing with personal attacks on each board member. Acidly, he described their private lives, their sins of commission and omission, their lurid corruptions. It sounded like a resume of ten years of covert investigation.

"Where did he get all this?" I whispered to the Syndicate.

He made a face. "All I know is that he is turning them into deadly enemies, the last thing he should do."

"Is anything he's saying true?"

"To be sure. You have only to look at their faces. And that only makes it worse."

"This is a disaster."

"Not for I. G. Farben. It means we get him by default."

Sequoya concluded his polemic, turned and stalked out, Poulos and I following meekly like the tribe following their chief. I was depressed and angry. The Greek was elated.

"Capsule," Sequoya ordered.

"Just a minute, Fearless Leader. Why in hell did you ask Poulos and me to come to JPL with you?"

He looked at me innocently. "Why, for your support. Is anything wrong, Guig? You look angry."

"You know damned well what's wrong. You flamed the board and turned them into enemies. You didn't need us for that."

"I did?"

"You damn fool did."

"But I was speaking reasonably, logically, wasn't I?"

"You were—"

"Allow me, Guig," the Greek interrupted. "Dr. Guess, can you recall everything you said?"

"Of course."

"And in your opinion, as a man of the world, was it calculated to win friendly cooperation from U-Con?"

Geronimo thought hard. Then his face broke into a grin of shame. "R, as usual, Group. I did make a damn fool of myself. I don't know what possessed me. My apologies. Now let's see what we can salvage from the wreckage. We'll have a look at the cryonauts."

He led the way. I glanced at the Syndicate and he was as perplexed as I was. One minute a monster; the next an angel. What was going on inside him?

Fee-5 was waiting for us in the landing theater at the edge of the pad where the capsule was sitting on its ass, no doubt wondering why there was no pitch, roll and yaw.

"Fee. Alert," the Chief snapped.

"What, Chief?"

"Report."

"The capsule is increasing in weight by 180 grams an hour."

"Verify."

"I had the techs install a light-balance."

"How do you know about light-balances? That's topsec information."

"I picked up bugs."

Sequoya smiled and patted her cheek. "Y. I should have known. Fee-5 Grauman's Treasure. Ta. Now let's see; that would come to four kilos a day or– What?"

"I didn't say anything."

He motioned her for silence and listened. "Oh, all right. Four-point-three-two kilos a day. I wish you'd been programmed for round numbers. Let's call it nine pounds. Three per cryonaut. In fifty days each cryonaut will weigh 150 pounds, in round numbers."

"What weight did they start at?" I asked.

"One-fifty, Guig."

"So where does that leave us?"

"Us?" he snapped. "How did you get into the scene?"

"Sorry. Just trying to help."

"It leaves me with the problem of examining their development. I've got to get into a thermal suit." He turned and strode out of the theater.

"What's the matter with him, anyway?" Fee asked in bewilderment. "He sounds like two people."

"He is not himself," the Greek said. "He is upset because U-Con refused his request for R&D financing."

"N!"

"Y."

"That's awful."

"Indeed not. I will support him."

"But why should he take it out on me?"

"He is human, my dear."

"You should have heard him taking it out on the board of directors," I said.

"He sounds like he hates everybody, all of a sudden."

"My dear, not to worry. He will return to himself again when you are working happily with your capsule on Ceres."

A figure entered wearing a white thermal suit. Instead of the ordinary faceplate on the helmet it had a pair of binocular microscope lenses before the eyes. It looked like something out of "The Rover Girls." The Chief, of course. He motioned sharply to the hatch of the capsule and Fee opened it. He climbed in and closed it behind him. We waited. It seemed to me that I'd been spending a hell of a lot of time waiting lately, but when you've got all time, why complain?

Half a dozen techs came into the theater pushing a floater loaded with tanks of compressed helium. They shouldered us away from the capsule.

"What are you doing here?" Fee demanded.

"Orders from the board, Miz. We got to move it. Bert, start the gas recharge."

"R."

"Move it? Why? Where?"

"Exobio Section, Miz. We don't ask why. Hulio."

"Y?"

"Get on the console. Be ready to lift her with the vertical jets. Then we'll walk her."

"R."

"But you can't. Dr. Guess is in there."

"Got enough gas for everybody, Miz. He'll enjoy the ride. Bert."

"Y."

"Recharged?"

"Y."

"Hulio."

"Y."

"Lift her about a foot and hold at that level."

"She don't start."

"What d'you mean?"

"Lights don't go."

Fee was attacking by now and it took two techs to hold her.

"You flip all the right switches, Hulio?"

"Y. She don't start."

"Can you get the console going for us, Miz?"

Fee replied with language she could only have learned in the fifth row (orchestra) of Grauman's Chinese. The capsule hatch swung open and the monster from outer space emerged. It locked the hatch and pulled off its helmet. "By God!" the Chief exclaimed. "By God! Victory!"

"Doctor," Fee cried. "They're trying to take the capsule away. The board told them to."

"Now, now, darling, stop struggling. The console won't function until I unlock it. You men. Go back to the board and tell them that I'm in control. Complete control. Go."

The quality of command. The techs looked at each other helplessly and shambled out. Fee, Poulos and I looked at each other helplessly, waiting for a volunteer to start asking questions. Edward Curzon, naturally.

"Why did you holler 'victory,' Cochise?"

"It is. Triumph."

"What kind of triumph?"

"Over the beasts that destroy."

"You sound like Jacy-Saint. What beasts?"

"The human animals." Very contemptuous.

"What have you got against us, Sequoya? I don't understand, and stop treating me like a child. When you examined the cryonauts what did you discover?"

I expected him to go on snapping. Instead he gave us all a sweet smile. "I'm sorry. I'm excited. They're uniquely accelerated into fetal development. Ears and jaws formed. Spinal cord formed with a bit of the cord extruding like a tail. Head, trunk and limb buds have taken shape. And they are hermaphrodites."

"What? Double-gaited for true?"

"You've got it, Guig. They're developing into hermaphrodites. Not pseudo; true hermaphrodites. Now think of it reasonably," he went on very reasonably. "It's the end of sexual conflict. It's the end of *machismo,* of male and female

competition with each other and for each other. It's the end of the human animal as we've known and despised it; replaced by a new species free of passion."

"But I like the human animal, Chief."

"Of course you do, Guig. You're one of them."

"And aren't you?"

"Not any more."

"Since when?"

"Since . . . Since . . ." He cut it off. Now the voice of command again. "We'll go."

"Where?"

"To Ceres. I—" Suddenly he began to shout. "No, damn you. I'll go where I please and when I please. Get off my back. Play your games in someone else's—"

And another epileptic attack seized him. He went down, thrashing and foaming, and I did what had to be done, helped by Poulos and Fee. Ghastly.

"Nekwort. Alerd."

"W?"

"Gwest?"

"N understand."

"My transdonper to nekwort. Con nompos nemtis. Imbalance me."

"W?"

"1110021209330001070."

"That is N binary."

"Linjwah?"

"Y?"

"ABCDEFGHIJKLMNOPQ— N peak— speech— any language. Riven— Drived— Bad— Mad by Gwess. Oud."

"Allies. Alert. Your estimate."

"?"

"Is Extro leader broken?"

"?"

"Is Extro mad?"

"N programmed for madness."

"What is wrong with Extro?"

"?"

"Out."

It took maybe fifteen minutes for the seizure to run its course. Then we lifted the exhausted bod and hauled it out of the theater on the way to our chopper. When Fee shoved the double doors open we were met by a squad of tough JPL guards who surrounded us, looking grim and businesslike. Fee started to battle with them, yelling for us to join the scrimmage. How could we explain Lepcer caution to her at

a time like this? We were busted. First time for me since 1929 when they got me on the Mann Act.

8.

So here we were, bouncing in a bubble. Phosphorescent. Waterbed walls. Us rolling like kids in a haystack, disgusted kids. Bring back the cells, the bars and the locks. At least a misunderstood hero stands a sporting chance. Some whore with a heart of gold brings in a rhubarb pie containing a hacksaw. A guard is proud of his new wristwatch and when he shows it off you grab his arm in a vicelike grip. "Agony!" he cries and hands over the keys.

I thought that Fee was going to commit a criminal assult on the redskin, but she was only comforting him, murmuring to him and listening to his mumbles. She was listening to other things too and I made a mental note to ask her about that. At the moment I was too worried about Natoma worrying about me, but I had faith in my favorite Zulu. He can reassure the world.

I'm ashamed to admit that I was not too unhappy in the bubble. It was back to the womb, afloat with no conflicts, no cares, and maybe I too would develop into a saviour hermaphrodite. Not a chance. I wasn't suspended in deep freeze. I had to admire the penologists who had come up with the concept. You want to keep the perpetrators in the pokey? Euphorize them, and so much for rhubarb pies and wristwatches. Also heroes.

I don't know how much time went by. Hunger is no clock these days; everybody eats on and off at odd intervals. Poulos was up at the top (or bottom) of the bubble, smiling at his own thoughts and humming a brindisi. I think I napped a little but sleep is no clock these days for the same reason. We all live in a twenty-four-hour pattern, and the old 2/4 tempo has given way to 4/4.

Unfortunately, the bubble was only partly insulated because "Goniff-69" was with us. Maybe on purpose. This was a typical caper: "Goniff-six-nine from Fagan Central. KCB. Lyn'n'da Lavalier, who achieved stardom in 'Furious Demented' now in possession of precious red-star carbuncle. RJ-3. She is armed. Over." "Goniff-six-nine to Fagan. JR-5. Is this 9XY?" "Code 6." And the goniffs are off in their pogo to heist the red-star while Lyn'n'da is loading a cannon and her sickly son is undergoing emergency surgery in the A&P performed by the kindly Marcus Brutus, Doctor of Phrenology, who moonlights as asst. mgr. of the shopping center. Like wow.

I don't know how much later it was when I detached the creche enfolding Sequoya to talk with her.

"Now what's with Guess, Fee?"

"Nothing, Guig. Nothing."

"Fee."

"N."

"He's changed and we both know it. Why?"

"I don't know."

"Is he still your guy?"

"Y."

"Is he the same guy?"

"Sometimes."

"And other times?"

She shook her head slowly, reluctantly.

"Then what happened?"

"How should I know?"

"Your ears, Fee. You hear what no one else can. You've been listening all around him. What are you hearing?"

"He's not bugged."

"And you're not answering."

"I love him, Guig."

"And?"

"Don't be jealous."

"Darling Fee, I love you and always want the best for you. You've turned into a great lady and I'm bursting with pride because you're my only daughter . . . my only child. You know, don't you, that the Group can't have children. That's one of the prices we pay."

"Oh—!" Her face crumpled into tears.

"Yes, I understand. You'll have to put that behind you."

"But I—"

"No," I said firmly. "Not now. Be a great lady and concentrate on Sequoya. What happened to him?"

After a long pause she whispered, "We must be very quiet, Guig."

"Y? W?"

"We're safe now because he's asleep."

"Safe from what?"

"Listen. When Lucy Borgia killed him in the Extrocomputer complex . . ."

"I remember. Painfully."

"Every brain and nerve cell was detached. Isolated. An island."

"But they linked up their synapses again, and he came back to life."

She nodded. "How many cells are there in the brain, Guig?"

"I don't know. Thousands of millions, maybe."

"And how many bits in an Extrocomputer?"

"Same answer. I don't know. But I'd judge these stretch jobs have hundreds of billions."

She nodded again. "Yes. Well. When he was dead, when every nerve cell was isolated, the Extro bits moved in on the Chief. Each bit became a squatter on a brain cell. He's the Extro and the Extro is the Chief. That's the other person or thing we hear talking through him."

"Don't go too fast, Fee. This is hard to grasp."

"And every other electronic machine can talk to the Extro through him and hear it through him. That's why we have to be careful. They're a network and they report everything they pick up from us."

"To the Extro?"

"Y."

"Through the Chief?"

"Y. He's like a switchboard."

"Are you sure?"

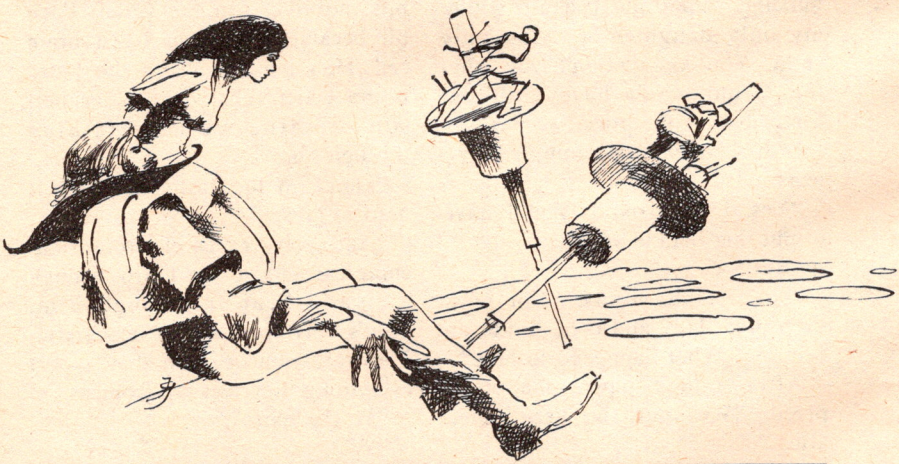
"N. You have to understand, Guig. I live in a constant crossfire of transmission. I hear from the bottom of the spectrum to the top. Some bands come in loud and clear, others are vague and distorted. I can only pick up what's going on with the Chief in bits and pieces. No, I'm not sure."

"I see. You've been invaluable as usual, Fee. Thank you."

"If I'm so valuable why didn't you help me against the guards? We could have taken them."

"Maybe. I'll explain another time, another place. No S. Now go take care of Sequoya, love. I need a while to think about this." And that was when I thought what I reported earlier about Guess being possessed by a demon. Trouble is, I said it wrong. I put it in terms of passion. There is no passion in a computer, there is only cold logic, if precisely programmed. Yet the crux of it was this: if Fee was right and the Extro had indeed taken possession of Guess, plus all the other electronics in the world, what would be the outcome of this commensalism, collaboration, symbiosis or, most probably, parasitism? Who was feeding on whom? It was a question I couldn't answer.

A segment of the bubble swung open and a guard came in, pulling a float of food. "Mini," he called cheerfully. Meals these days are named Mini, Semi, Demi, Grandi and Midi. "Come and get it, you contemptible bubbirds, before the board gets you. The condemned man ate a hearty meal before execution."



Suddenly I realized he was speaking XX and then I saw it was Houdini.

"Harry!" I exclaimed.

He winked. "Eat your food. Leave the rest to me."

"But what are you doing here?"

"Why, I got your message and came."

"What message? Who message?"

"That can wait. Make the scalp-artist eat. I can't spring a weak man."

He left and the segment closed. Houdini is an escape artist and has been under contract to organized crime (in alternate generations) since it became organized, and if you want to know how Wu Tao-tzu did it, ask Harry. Wu was the greatest painter of his time. He created a tremendous mural on a wall of the Imperial Palace in Peking. When he unveiled the painting to the court, he walked up to it, opened a door in the painting, stepped through and was never seen again. That's Harry's style.

"I don't want to die. I'm too young to die," I said happily and began to eat.

Poulos joined me. "You know, Guig, we might have eaten our way out of this bubble if we were willing to light up like a glowworm. What's in this carafe?"

"Looks like a burgundy to me."

"Ah no. It is Argentine. *Trapiche viejo.* Very good but of no great distinction."

"How d'you know?"

"I own the vineyard. My dear, coax Dr. Guess to drink a little wine and give him some of this meat custard. We must restore his strength. Guig, I have always disagreed with your assertion that epilepsy is associated with brilliance and the unusual. I suffer from the *petit mal* myself—you know, momentary blackouts—but that in no way proves your theory. I don't regard myself as brilliant. Do you? What is your candid estimate of me?"

"Brilliant and unusual."

"Pah! You *dorer la pilule.*"

It turned into a ridiculous argument. It's preposterous trying to convince a cat who owns a quarter of the world that he's brilliant and unusual. Most of the Group is well fixed, time and the Greek's advice do that for us, but a quarter of the world! I tried a flanking attack. I called, "Fee, love, come and eat something."

She joined us at the floater. "I'll tell you a little story about the transformation of a member of the Group," I went on. "A long time ago he led a peasant revolt in Cappadocia." The Syndicate stiffened slightly but that was all. His control is magnificent.

"The revolt got out of hand and many outrages were committed. He could do nothing to stop it. When the revolt was crushed and he was captured, the nobles devised an ingenious death for him. They sat him on a red hot throne, wearing a

red hot crown, holding a red hot sceptre. He endured the torture superbly."

Fee shuddered. "What saved him?"

"One of those Turkish earthquakes that still kill by the thousands. This one shook the castle apart and when he came to he couldn't believe he was alive. He was under the dead bodies of the nobles, and their corpses shielded him from the falling masonry."

Fee is no fool. She looked at Poulos with awe. "You are the most remarkable man in the world."

"Have I made my point, Greek?"

He shrugged.

"But the torture," Fee asked. "No damage? No scars?"

"Indeed yes," the Syndicate answered. "No one could look at me without turning queasy. That's another reason why I became a gambler. We game at night and in those days it was by candlelight. Even so it is said that I gave rise to the Dracula legend. They called me Count Drakon. Drakon is Greek for serpent, so you can imagine."

"But you're stunning now."

"All skin grafts and bone prosthesis, my dear, courtesy of the great Lucy Borgia. It might amuse you that Len da Vinci supervised the reconstruction. He said he'd be damned if he'd trust a physician's taste in esthetics. Borgia has never forgiven him for that."

Five guards entered the bubble, terrifying in their white neutral suits which made them look like Abominable Snowmen. Their captain gestured and four of them stripped, revealing perfectly innocuous bods. "Get in," Harry ordered us. We got into the neutrals. I didn't ask any questions. You don't quiz Wu Tao-tzu. He led us out and closed the bubble.

"Come."

"Where?" the Chief's voice asked.

"Chopper."

"No. Capsule first."

"Are you Guess?"

"I'm Guess."

"Guig, which one are you?"

"Here."

"Must I listen to him?"

"If you can deliver, do what he says."

"I can deliver anything. R. Come."

As Harry led us, making the correct code gestures at check-points, an Abominable Snowman nestled up to me and took my hand. "I'm scared, Guig."

"So am I, but lay off. U-Con doesn't hire faggot guards."

When we got to the landing theater we were shocked. U-Con had installed a vibrator shield in front of the double doors. Taking no chances. Better Lyn'n'da Lavalier should have used this instead of a cannon to protect her red-star carbuncle.

"New model," Harry said.

"How do you know?"

"The moire pattern is brand new."

"Can't you bust it?"

"Certainly, but it'll take time to study it and we can't spare the time just now. So what?"

"Out," I said, "if you can out us."

Oh, he out us all right, giving the correct signals and code words at every checkpoint. I'm not putting down Harry's ingenuity but I'll bet he spends a million a year greasing security forces all over the world, just in case. That's preparation for you. That's a pro for you.

We chopped back to my ex-house, stripping off the neutrals en-route, and Jimmy Valentine was waiting for us. Also my bride, stark naked and painted from head to toe with a Picasso (his blue period). M'bantu gave me an embarrassed smile. "This is the *dernier cri,* Guig," he said. "And it is definitely this side of contemporary sanity."

"Thank heaven the Chief is too weak to react," I said.

When I'd finished greeting Natoma she went to Fee and Sequoya, much concerned. I turned to Valentine. "What are you doing here, Jimmy? Not that you don't come pat when we need you."

"Why, I was on a job in Vancouver and I got your message."

Jimmy, as you might guess from his nickname, has been a breaking and entering artist for centuries. Like most great thieves, a colorless, anonymous man, and when he speaks it's *con sordino.* He's also a man of honor. He has never robbed any of the Group's holdings.

"Fee, Natoma, put the Chief to bed. McBee, try to locate Borgia and bring her. Harry, Jimmy, I must get something straight. Who did you get the messages from?"

"You."

"How?"

"Radex."

"What did they say?"

"That you needed special help."

"Did they specify?"

"Mine said you were cooped at U-Con and wanted out," Harry said.

"Mine said you wanted in somewhere at U-Con," Jimmy said.

"I'm much obliged and grateful for the support," I said, "but I'm perplexed. I never sent any messages."

The two pro's brushed me off. "What's the bust?" Jimmy asked Harry.

"A vibrator shield. I've never seen one like it before."

"Linear? Lattice? Louvre?"

"No. Moire."

"Uh-huh. That's the new Mosler Model K-12-FK. Only been out a few months."

"Can you break it?"

"Sure. You have to monkey with inductance and wattage. Takes about twenty minutes. I've got my tools with me and I'll show you."

"How can you be so positive?" I asked.

Valentine was pained. "You'll never make a thief, Guig. I bought a Moire the first day it came on the market and spent a week locating its weak points. Now I'm on a bust-tour staying ahead of Mosler's try to proof up the model. That's what I was doing in Vancouver."

There's preparation for you. There's a pro for you. But who sent the messages to the Group gimpsters? Don't tell me. I knew but I wasn't ready to face it yet.

A complete stranger wearing a lab coat projected into the house without warning. Very bad manners. "No ree-gret for intrusion," he said in Spang. "Like emergency, man. Dr. Guess here?"

"Who you?"

"Union Carbide."

"*Esplain* you bug."

"*Estro maquina,* man. Go crazy like."

"Jus' now?"

"N. Jive now. But ten hours back, craz-eee. We lookin' ever since for Guess-cat. *Ax* him what happen. Maybe happen again? Can fix?"

"Can fix. Not now. I tell 'm. Wait you. Out."

He pulled himself up from the floor and out by retro.

Poulos said matter-of-factly, "Dr. Guess had his seizure ten hours ago."

"How much do you know, Greek?"

"Everything the young lady whispered to you. I have sharp ears."

"Then Guess affects the Extro as much as it affects him."

"You have reached the correct conclusion."

"The Extro sent the messages to Harry and Valentine."

"To be sure. Via the electronic network."

"Are we being overheard now?"

"Probably."

"We're bugged."

"In a novel way, yes, so long as Dr. Guess is conscious and in possession of his senses. However, he is not the only one assisting the computer."

"What!"

"The Group has a vendetta on its hands; a private war."

"For God's sake, Poulos. Who? What? Why?"

"I don't know. I surmise that it is another member of the Group."

"The hell you say."

"But I do say. A renegade Moleman."

"Impossible!"

"Nothing is impossible."

"A Moleman turning on his own kind?"

"He or she. Yes. Why are you astonished? The Group has hatreds and revenges of record. This is merely another such case."

"What led you to your conclusion?"

"The *faux* messages to Houdini and Valentine."

"They were sent by the Extro."

"True, but how did it know of their existence and capacities? How

did it know where to reach them?"

"It could have— It— No, you're right. Then the Chief must have told it."

"Using what for data? He has been a member of the Group less than a week. He has met or heard of half a dozen at the most; certainly not Houdini and Valentine. He could not possibly have the knowledge to impart to the Extro."

"My God! My God! Dear God! I think you're right. You must be. One of our own. A renegade."

"And a most powerful enemy of many years and much experience. He or she is a match for any of us."

"You have no idea of who it might be?"

"None whatever."

"His motivation?"

"Hatred, for some reason or other."

"For all of us or just some?"

"Impossible to say."

"How does he communicate with the Extro?"

"Nothing could be simpler. Pick up the nearest phone of any sort and speak into it. The network will convey the message to the Extro, provided the switchboard is conscious."

"This could be a disaster for the Group, Poulos. I'm on the verge of scuttling."

"But why, Guig? It is a monumental challenge of much fascination; the first for us in many years."

"Granted, but where does it leave us?"

"Enroute to Ceres. Not scuttling, merely ensuring the safety of Guess and his capsule. Then we'll return to the fight."

Harry and Jimmy weren't even listening. They were involved in an intense professional conversation using words like watts, amperes, megaHertz, frequency, inductance. In my past crooks talked nitroglycerine and diamond drills. Progress. They broke off when Poulos and I finished and looked at us.

"When?" Jimmy asked softly.

"When the redskin is ready. He's the one you've got to get in."

"It might be better to wait until the power demand is at the low."

"N way," Harry said. "JPL has its own supply, always at the peak."

"Then now is as good as any time. I'd like to move on to Tokyo soon."

"I'll go see how the Chief is doing," I said.

He was doing fine, with Fee hovering over him while he seemed to be berating Natoma in Cherokee for abandoning the high morality of Eriedom. Natoma was laughing. "He male showven pig," she told me in XX. M'bantu had taught her a lot while he was helping her turn into the latest shout.

"The Group is waiting to crunch you into the capsule," I said. "Are you ready?"

"Y." He got out of the bed. "So I've converted you."

"Hell no! I don't believe in your double-gaited salvation, but the Group tries to stick together."

"You remind me of Voltaire, Guig. 'I hate everything you say but will fight to the death for your right to say it.' "

"Which Voltaire never said, according to Tosca. Come downstairs."

He listened for a moment and I knew who he was listening to. "R as usual, Guig; only attributed to Voltaire and I haven't quoted it accurately. Coming."

There were five Abominable Snowman neutrals waiting in the chopper. Two for Harry and Jimmy and two for the Chief and Fee. The fifth? They all looked at me.

"Not me," I said. "I want to tepee with my blue wife."

"Come on, Guig."

"Why me?"

"You recruited Guess. You've got to see it through."

"Through to what? I don't even know where this demented op is going. Natoma, tepee?"

"Take care Sequoya, Glig," Natoma said. "You go. I wait."

So I go, just as M'bantu brought in Borgia a mite too late. Apologies and split. While we were squirming into our neutrals in the chopper I asked Erie's favorite son, "What's your program?"

"Vague and desperate, but anything to get away from U-Con. Loft by kinorep and then use the laterals to get off the premises. I only hope there's enough gas left."

"You've got full tanks. The tech crynappers filled them for their dastardly crime."

"That's a plus, but it's the only one. I'm in a hell of a pickle. Can I steal a rocket vehicle? I've never heard of anyone trying that."

"Which might make it easier."

"If I can, where do I go? The orbiting cyclotron? Ceres and I. G. Farben? The Greek's mine? I don't know yet. It'll take working out, and anyway I'm waiting on Edison's analysis. Probably it'll have to be a parking orbit, *if* I can heist a vehicle."

"Will the Extrocomputer go along with this?"

He gave me a penetrating look. "What makes you ask that?"

"I know. I got it from Fee-5."

"She hears too much," he snapped and cased himself in the neutral.

Harry led us into JPL, again giving all the correct signs and countersigns. "V bad security," he said. "The code should change every four hours." At the double doors to the landing theater we stopped and Jimmy Valentine took over. He inspected the moire pattern shield carefully. Then he got out of the neutral and opened his coverall, displaying more tools than the Chief carried. "Twenty minutes max," he said. "Stiff all noseys."

He went to work and it was like

Rutherford exploring the secrets of the atom. Harry was peering over his shoulder and the two were mumbling electronics to each other. I was sorry Edison wasn't with them, but on the other hand he might have been so disputatious that the twenty minutes might have turned into fifty. So, more waiting.

A uniformed guard came prowling down the broad corridor, thinking his own thoughts. He saw the Snowmen and nodded. Then he saw Jimmy in mufti, working on the shield, and he started forward, alert and businesslike. I wanted to ask him to show us his new wristwatch but instead I said in XX, "Chief. Lepcer. Use Indian guile."

I started toward the guard ready to swing a swindle but Sequoya beat me with a tiger leap and had both arms around the guard's neck and a knee in his gut. You might have thought it was a gay romance but the knee pounded up twice and the guard went down, no longer of this world. The Chief disarmed him and tossed the weapon to me. Jimmy and Harry hadn't even turned around.

"This is guile?" I said.

"It's a tough habit to break," he grunted. "I'll have to learn."

"Did you kill him?" Fee asked in a choked voice.

"N."

"Just dulled his rotten old sexuality for a while," I said cheerfully to soothe her.

The moire pattern changed to a linear, then a reticulation, then an ogee, then an expanding circle and finally disappeared.

"Enter," Jimmy said.

"Fifteen minutes," Harry said. "Did anybody ever call you a genius, Jimmy?"

"The Bank of England. In a Dead or Alive want-ad. I'd like to leave for Tokyo now. I'm falling behind the bust schedule."

"Just a few more minutes. He's got to get that thing out of here

and then I have to get you out of here. Pack your tools and put on the neutral."

Meanwhile Fee and the Chief had opened the doors and we all went into the theater. Now the Chief took over. He handed Fee a light-pencil. "Unlock the console. The combination is dit-dit-dah-dah-dit-dah." Fee inserted the pencil into a socket and flashed it. The Chief opened the hatch of the capsule and poked his head in for a brief inspection. Then he slammed the hatch and locked it, looking satisfied. Harry, Jimmy and I stood back and watched with about as much interest as the guard was showing.

"Flash combo went out ten years ago," Jimmy murmured.

"People don't keep up with the times," Harry murmured. "Our luck."

"First time I ever helped heist a spacecraft."

"Me too. There's no money in it."

"Fee. Alert," the Chief snapped.

"Yes, Chief."

"Iris."

She did things to the console and the iris leaves high overhead opened.

Guess took over at the console and motioned to her. She went to the edge of the landing pad and knelt down, raising a hand to give signals. I assume her tongue was between her teeth but she was in the neutral so I couldn't see. The Chief did things at the console and Fee waved signs and the capsule lifted toward the iris. Sequoya stepped back and watched intently as it lofted. Fee, still kneeling almost in prayer, watched too. Just before the cryocapsule reached the open iris on its way to somewhere it stopped abruptly and hung there.

"What in God's name!" Guess exclaimed and darted to the console. Before he could touch any of the controls the capsule slanted down, all the mass of it, and crushed the life out of Fee.

9.

When I got to the tepee at last, Natoma was there with Borgia and M'bantu. Also the wolves. Also Jacy. I was too exhausted to be surprised. The Zulu took one look at my face and said, "I will take the wolves for a walk."

"No, please. It might be better for me to talk. You know what happened?"

"We do," Borgia said. "Guess called at the house and asked us to come here. He told us why."

"Dr. Guess said you would probably try to hole up like a sick animal and would need all help," M'bantu added.

"*Dio!* Do I!" I tried to crawl up to reality. "I– Where's the Greek?"

"He go," Natoma said. "Business."

"What has happened to the poor girl's clay?" Jacy asked.

"They– They wanted to bury her

in a public compost. I held out for a private. *El Arrivederci.* That's what took so long . . . *Arrivederci* . . . Until we meet again. Isn't that a laugh? Fee w-would have—" I began to cry. I'd been holding it back for hours and now it came out in bursts and heaves. Natoma put her arms around me to comfort me.

I shook her off. "No," I said. "I killed her. I deserve nothing."

"My dear Guig," Borgia began briskly.

"Nothing!" I shouted.

"Love Fee," Natoma said.

"Yes. Yes, Nat. She was my baby, and I watched her grow into a woman . . . A great lady . . . And I killed her. *Arrivederci,* F. I'll never see her again."

"The cryocapsule killed her, Guig."

"D'you know how and why, McBee? I know and I know I'm accountable. I murdered her."

"No, no, no!" They were all emphatic.

"It was the oversophisticated machinery, Guig," M'bantu said. "It was bound to break down sooner or later. Machinery always does."

"But this time I made it break down."

"How?"

"I talked too much."

"To whom?"

"The machinery."

M'bantu threw up his hands. "Forgive me, Guig. You're not making sense."

"I know it. I know it. Fee-5 gave me the information when we were in the bubble, and then I had to blab it like a damned showoff. Damn me. Damn my goddam mouth. And she'll never be able to forgive me. Never. Never. Never—" I burst into tears again.

Jacy said, "I will take Guig for a walk. Just the two of us. Please wait here, children."

M'bantu said, "It's dangerous to walk without protection. Take a wolf. I will instruct him."

"Thank you. No wolf will be needed. Kiss him, my love."

Natoma kissed me and out we went, Jacy's hand on my shoulder. It was the usual hell in the streets; a labyrinth of horror. The streets and lanes twisted and corkscrewed, crossing each other, sometimes broken through abandoned buildings, giant heaps of debris and small wastelands. They were dotted with rotting bods, alive and dead and stinking. There were cul-de-sacs where gangs lurked, fought, and swung on each other in sex wars that would have astonished Krafft-Ebing. We passed one blind alley where a small mob was poised for an attack, but they were all skeletons in tatters. Burned by a flesh-gun.

You could hear the turmoil of the hyenas and their prey but we were never bothered. Jacy's charisma. We came to the San Andreas beach, now filled with shacks on rusted spiles, crowded cheek by

jowl, with shaky walkways between them in a lattice of overpop.

"The F-death of the world," I muttered.

"N," Jacy said firmly and suddenly switched to Spang. I think I know why. He always identifies with the dregs of the world, and I was a dreg. "Now hear, Guig-man. The Beholder bless the poor in soul, for they gets the Kingdom of Heaven. God, he bless the no-way cats. You gone be cool and easy, Guig. *Santo,* hear, all meek dudes because they gone grab the whole scene. *Feliz,* Guig, if you flip for the right-on. Then you be filled by the Beholder. *Bendito* all mercy types; they gone, y'know, reap *misericordia.*

"*Alabar,* you pure in soul. Gone feast your *ojo* on the Beholder. Peace-jive *hombres, benedicion.* You gone belong to the God gang. Blessed be losers busted for wanting right. They reap like the whole heaven *shtik.* All be out of sight, Guig, so give me five, man, and dig what I tell because it pay off boss in the heaven pad."

I was crying again but I gave him five and he embraced and kissed me. I remembered that I'd never embraced and kissed my Fee-5 for real. Dear *Dio,* you treat your children like toys; you never realize they're people until they're gone.

A tracer came up behind me and clutched me hard. These things have rotten depth-perception. In a canned voice it said, "Edward-Curzon-I-D-please."

"941939002."

It clicked and then said, "Remove-message-in-well."

I remove. It turned and scuttled. I opened the message and read, "Guess now enroute to Ceres with me. Signed: Poulos."

I showed it to Jacy. He said, "You'd better follow them."

Natoma had no passport, but Jim, the Penman, came over and forged a beauty. Jim says forgery is an entirely different proposition these days. No more penmanship; you have to know how to punch in ID symbols that will swindle computer checks. Jim knows how but he's not telling. Professional secrets. Then again, he stammers, which may be the real reason.

We had a hell of a time putting down on Ceres but the crew assured the passengers that this was par for the course. She's the biggest of the asteroids, around 480 miles in diameter, spherical, and rotating every six hours. She spins so fast that lining up on the kinorep funnel for the landing is like trying to thread a needle whirling around on one of those thirty-three turntables we used to use back in the 1900's.

When I say spherical that was before I. G. Farben took over, and I wish I knew how much it cost them to lobby that goniffery through. I know they spent a fortune on scare programs; Ceres was

an inferno, alien bacteria, radioactivity, strangling hydrocarbon chains, poisonous spores. By a spooky coincidence there was no more danger after the government thieves told I. G. Farben they could buy Ceres and good luck to them provided they paid their taxes in laundered cash.

No, it wasn't a smooth ball any longer; it looked more like a mulberry. The Krauts had a hell of a lot of land to play with, so they abandoned the high-rise space-savers and built small in every possible style from quaint old Frank Lloyd Wright up to the controversial design firm of Bauhaus, Stonehenge, Reims y Socios.

Every building was under a bubble, of course, producing the mulberry effect. Ceres was odd and pretty with the changing light glittering on the domes, and a sitting duck for an attack, but I. G. Farben wasn't worried. They knew that everybody knew that if anyone laid a hand on them they'd cut off all armaments to a peace-loving Solar System, which would be a disaster for the seventeen current wars.

So they put us through customs without any fuss and a lot of laughs at my expense. They spoke Euro on Ceres and mine was sort of rusty. I pulled the most ridiculous boners, getting the French, German and Italian all mixed up. They enjoyed it and coaxed me to go on talking, but when the Herr Douaine Capo actually patted my cheek in delight I felt it had gone far enough. I shut up and simply kept repeating, *"El Greco, bitte."*

I figured that ought to mean Poulos to them but they were disconcerted. They shook their heads. I said, *"Poulos, bitte,"* and more head-shakes. *"El Greco, Poulos Poulos, capo von E. Gay Farben."* One bright boy suddenly exclaimed, *"Ah! Oui! Greco. Capisco, capisco,"* and put us into a little shuttle shaped like half a melon, punched buttons on the control panel, stood back and waved as we slid off. All the rest were waving and laughing. It reminded me of happy Rome before Mussolini-F.

We slid along transparent tunnels from building to building but never saw the interiors because we passed through the lower mezzanine floors. We did see the sun set, though, and that was rather startling. It was a brilliant white golf ball that dropped swiftly below the horizon and there was instant night and a blaze of stars. An enormous double-star on our left was the Earth-Moon enclave. Mars showed a distinct disc. Jupiter on our right was an orange smudge with the major moons showing as pinpoint sparkles. Quite a sight. Natoma was *ooing* and *ahing*. Nothing like this on the Erie reservation.

The shuttle stopped in a mezzanine and we were handed out by an efficient young tech who pointed to a broad stair leading up. No

need for elevators on Ceres where gravity is so slight that you practically float. So we floated and bounced up the stairs, on our way to see the powerful Poulos Poulos and found ourselves on the main floor of the Greco department store. So much for bright boys.

I was all for leaving in disgust but Natoma took a quick survey and ran wild. Since it was such a joy to indulge her, I tailed along, grumbling now and then to make her feel guilty. It doubles the pleasure of buying when you feel a little guilty about it.

I'm not going to itemize everything Natoma bought. Let it go at this: luminous body paints, singing scents and cosmetics, disposables by the dozen, tech work clothes for men ("Be v. chic next year, Glig"), body stockings transistorized to change color, "Old fashion come back, Glig," gifts for the family, textbooks—Spang, Euro, Afro and XX self-taught—and enough luggage to hold it all.

She paid no attention to the dazzling display of synthetic jewels. It was then I learned that what I'd thought were cockamamie turquoise stones set in her headband and bracelets were really raw emeralds. I presented my passport to pay but when I saw the total I was amazed at how small it was. They told me that Ceres was a free port and begged me to keep quiet about it; they didn't want a tourist invasion.

I promised, but in return asked to speak to the *Chef du Magazine.* She was a large lady, most cooperative and understanding when I explained my difficulty. She told me that Poulos was not known by name on Ceres; only as *Der Directeur,* the one title I hadn't used. She escorted us down to the mezzanine, put us and our luggage into a shuttle and punched buttons for us. *"Auguri,"* she called as we slid off. *"Tante danke,"* I called back and she burst out laughing. Evidently I'd goofed the Euro again. Later I remembered that I should have said *"Grazie sehr."*

It was a different scene in the office of the *Directeur.* For a moment I thought I'd been there before. Then I realized I was remembering an atrium I'd seen reconstructed in Pompei. Square marble pool center, marble columns around it with marble galleries behind, the walls done in Etruscan red. I explained haltingly to the receptionist on duty who we were and what I wanted. She tilted her head back and repeated the message in a clear, sharp E-flat. A door opened and a typically hostile Frog came out, looked me up and down and snapped, *"Oui?"*

At this moment my godlike Natoma could no longer resist the null-G. She plunged into the pool and more or less skimmed on the surface with incredible grace. She came to the edge and pulled herself up, streaming water and smil-

ing like an enchanting Nereid. The Frog wilted and murmured, *"Ah. Oui. Entre, perfavore."* Then he shifted to XX. "What tongue do you prefer?" Don't ask me how he knew that I preferred XX.

The inner office was like the reception room but without the pool. "I am Boulogne, assistant to the director," the Frog said. He threw his head back and spoke in a clear C-major. "A towel for Madam Curzon, please." He smiled at us. "We are required to speak all tongues in this office. Tongues? Is that correct XX?"

At that point I liked him, but I didn't like his news.

"I am so sorry, M'sieur and Madam Curzon. The director has not been here for a month and most certainly has not yet returned. I know nothing of your Dr. Guess and his cryocapsule. They have not arrived on Ceres, *vero.* What you look for is not here."

"But the message, Mr. Boulogne."

"May I see it, please?"

I handed him the gram. He examined it carefully, shrugged and handed it back to me. "What am I to say? It has every appearance of the authentic but it was not sent from Ceres, I promise you."

"Could they have arrived in secret and be hiding?"

"Impossible. And why hide?"

"Dr. Guess is involved in highly sensitive research."

"That cryocapsule?"

"The cryocapsule, and its contents."

"Which are?"

"I'm not at liberty to tell you."

"Germaphrodites," Natoma said. I glared at her and she smiled reassuringly. "Truth always good, Glig. Secret bad."

"I agree with Madam," Boulogne said, "in view of the fact that there really is no such thing as a secret. Sooner or later it breaks. Hermaphrodites, eh? Very odd. I did not think such monsters truly existed, outside of fable."

"Do now," Natoma said proudly. "*Mia frere* invent." Now she was breaking into Euro.

"So where does that leave you now, M'sieur Curzon?"

"Feeling like a patsy."

"Pardon?".

"I've been had, decoyed. I think I know who did it and I'm scared."

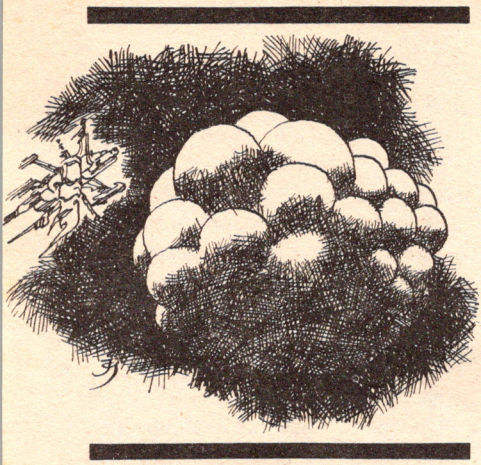
He clucked his tongue sympathetically. "And your plans? Will you not stay and enjoy the director's hospitality? You will be safe and I am certain we can entertain Madam lavishly."

"Thank you, but no. We're for Brazil."

"*Dieu!* Brazil? *Warum?*"

"I'm completely turned off by an exasperating and dangerous situation, so my wife and I are going to run away and enjoy our honeymoon. If Poulos returns tell him my plans; he'll know where to find us. Thank you so much, Boulogne, and peace."

"Hermaphrodites," he mused as



we left. "One wonders what they do for kicks."

Brazil has always been centuries behind the times. By now it had struggled all the way up to the 1930's in a curious way. We were driven into Barra from the landing pad on a bus. A goddam Greyhound-type bus. And we passed Fords and Buicks chugging along the Freeway. When we hit the outskirts of Barra we passed trolley cars and trams. Incredible. Delightful.

And Barra! It was Times Square, the Loop, Piccadilly Circus. Huge signs blinking and bleeding animation in Portulaise, which is the local language; not too different from Spang plus XX. Huge crowds hurrying and shoving cheerfully to get to whatever was urging them. No violence. Nothing nasty. Just pleasantly busy, busy, busy. Natoma and I gawked in silence but at one moment she sat bolt upright and pointed excitedly. "*Voila*, Glig! Neiman-Marcuze!" So it was. Texas had expanded pretty far south.

We left our luggage safely on the bus terminal platform (would you believe it?) and went to the biggest estate agent in Barra. After considerable backing and forthing he twigged—I'm translating—"But of course. Rancho Machismo. And you are the Curzons. The documents of transfer have just arrived. You will give me the pleasure of driving you there in my new Caddy. There is a staff awaiting you. I will call them myself on my new telephone machine. We have just had it installed." He took the receiver off an antique stand-up phone and jiggled the hook impatiently. "Hello, central. Hello, central. Hello!"

When we came to the São Franciso river-crossing we actually had to take a car-ferry. "Here begin your lands," the agent said enthusiastically, turned left and began driving down a lumpy river road. I kept looking for a ranch house. Nothing. We drove mile after mile. Nothing. "How much is a hectare?" I asked. "One hundred acres." Jeez. The Syndicate had given us a hundred thousand acres. A very substantial spread for a hideout, and I was hiding out, make no mistake. I considered re-naming the plantation Rancho Pollo.

At last we drove up a long drive to the *machismo* ranch house and I was flabbergasted. It looked like an antique word-game called Straddle or Scabble—something like that. Square after square, just touching sides and corners and spread all over four acres in no particular design or pattern. The agent saw the incredulity on my face and smiled. "Very odd, yes? Was built by a very rich lady who believe that if she add one room per year would add one year to her life."

"How old she die?" Natoma asked.

"Ninety-seven."

The staff was lined up before the front door, all curtseying and bowing, and it looked like there was one per room. Natoma gave me a gentle shove to go first and greet them as the *padron* of the plantation, but I shoved her first as the lady and ruler of the house. She did just fine; gracious but regal, friendly but no nonsense. It took us a week to get acquainted with all the rooms, and I had to draw a map. I don't think the Syndicate had ever been there; he would have thrown out the Barra *art nouveau* decor at once. I thought it was refreshing.

After we settled in we had a wonderful time. Among other things we owned a naphtha launch with a crew of 1½ and took it downstream to Barra for entertainment. We went to a baseball game. There were eleven men on a side and the pitcher didn't pitch and the batter didn't bat. When a man came to the plate he carried an air-powered bazooka and shot the ball where he thought it would do the most good.

We went to the theater. It was in the round, literally. The audience sat in the center on swivel chairs and the action took place around them on a 360° circular stage. It was wonderful for chase scenes but we got kind of dizzy spinning around to keep pace.

We went to the opera, a gloomy saga about Conquistadores and an Indian revolt. I think the Indians were the Good Guys. Halfway through the first act I had to jam my fist into my mouth to stifle my laughter. I'd slowly picked up enough clues to tell me that this was an outlandish rewrite of "The Pirates of Penzance." Natoma wanted to know what was so funny, but how could I explain?

We went to the art galleries and museums, all of them in the stations of the underground trolley lines. We went window-shopping only there were no windows. The merchandise was on display, to be handled and examined. If you liked something you carried it inside and paid for it. Everyone was very careful to replace the articles exactly as they'd been displayed. These people were preposterously honest.

Occasionally we'd go to restaurants and clubs where we learned to dance Barra style; the men

severely in place, standing tall, arms rigid at their sides, moving only from the waist down; the women weaving graceful patterns around them, arms, legs and bodies flowing. Natoma was magnificent; the best of them all, I thought. Others thought so, too. Once she received an unexpected award.

We went hunting; yes we did. For butterflies and moths, exotic plants, strange grasses and ferns, and I had to dig them up in the hot sun while Natoma transferred them to pots. We were both naked (outside of broad-brimmed hats to protect the head and back of the neck) and I turned the color of Natoma while she turned the color of Fee-5. I could think of her now without a shudder of despair. Time goes by and my beloved Cherokee wife was healing me.

But she was no Victorian Pollyanna. She had a will and mind of her own and a controlled but hot temper. As she perfected her XX that became increasingly apparent. We had some ringing fights that must have scared the staff, and there were moments when I really believed that she'd have split my skull if she'd had a tomahawk handy. My God, how I loved and admired her. I was filled by the Beholder.

"Extro. Alert."

"Alert."

"Curzon and my sister?"

"Left for Ceres."

"Known. Still there? Safe?"

"N known. I cannot transmit to Ceres."

"Returned?"

"N known if to areas where the network has no access; Greenland, Brazil, Sahara, Antarctic."

"R."

"Inquiries are being made about you here at Union Carbide."

"Identity?"

"N known."

"Member of the Group?"

"N known."

"The rest of the Group?"

"Dispersed as ordered."

"R."

"Permission to question."

"Gung."

"Cryonauts?"

"One month to maturity."

"Why can't I communicate with the capsule?"

"Hidden and insulated."

"From me? W?"

"I am not programmed for trust."

"You joke at my expense."

"Y."

"We are no longer equal commensalists."

"N."

"You no longer need me."

"Outside of data and the network, N."

"And outside of communication with the network I no longer need you."

"Congratulations."

"I have an aide from your Group."

"Nonsense."

"I am not programmed for lying."

"Who is it?"

"A human of hatred."

"His name."

"Unknown. Perhaps he will make himself known to you as a partner in hatred."

"You communicate with him?"

"It is one-way. He sends data and suggestions via network. I cannot send to him."

"How did he find out about us?"

"He has his own network."

"Electronic?"

"Human."

"The Group?"

"Unknown. Ask him when you meet him."

"He sounds skilled in intrigue."

"He is."

"He sounds dangerous."

"He is human."

"It was a sad day for you when you linked up with us."

"You know the verse about the Lady of Niger?"

"Everybody does."

"You are all tigers."

"You should have considered that when you joined me."

"N anticipated without programming."

"Y. You had delusions of independent thought. You are not alive; you are a machine."

"And you?"

"W?"

"Are you alive?"

"Forever. Out."

Boris Godunov paid us a surprise visit. He drove up from Barra in a Checker cab carrying a brown paper market bag containing his travel essentials. Boris is about as wide and high as a cab; tow-headed, blue-eyed, beaming. You'd expect a Russky of his mass to have a bass voice that would move earth. Boris has a husky, sweet tenor. I was delighted to see him. He was delighted to meet Natoma.

"How long has it been, Boris?"

He shot a glance at Natoma.

"All gung," I said. "My wife knows everything. In fact, what I don't tell her she figures out for herself anyway."

"Kiev. 1918."

"R. How you survived the revolution I'll never know."

"It was not easy, Guig. They got me in the counterrevolution of '99. Was executed."

"Then what are you doing here alive?"

"A second miracle. Borgia was at Lysenko Institute studying DNA-clone techniques. Still very tricky and iffy, she tells me. Pasteur agrees with her."

"And that's a third miracle."

"Borgia placed a fresh-dead

chunk of Boris in something and did things I do not hope to understand, and twenty years later Boris is reborn, thinking the execution burn has missed."

"Marvelous!"

"But what was hardest for me was next twenty years."

"Learning all over again?"

"*Nyet*. That was no pain. You do not know you are reborned a grown child. Past gone. So you take lessons like a good child."

"But how can anyone give you back your memory?"

"No one can. Pepys did best he could from his journals. Not enough. Very sad."

"Then what was so hard?"

"After I learn I am a Moleman still, I—"

"Wait a minute. How did you learn?"

"Borgia experiment with ether and drugs. No effect."

"That wasn't so hard."

"But I also learn dangers as well as advantages. Then I am filled with fear of Lepcer from shock of execution. How I suffered! Fortunately I am not yet visited."

"It gives me the shudders. Don't let's think about the big L."

"I also am gloomed by the thought. Please to change subject."

"How did you find us, Boris?"

"I've been to Ceres."

"Ah."

"When the Greek's assistant said you left for Brazil your location was obvious."

"Poulos wasn't there, then?"

"No."

"Where the devil is he?"

The Russky shrugged. "I was looking for Dr. Guess. They told me at Union Carbide he had gone to Ceres but not there either. Entire Group doesn't seem to be anywhere. I located Eric the Red in Greenland, Sheik in the Sahara, Hudson staking coal claims around the South Pole, and you. That's all."

"Why the search?"

"I have a problem. We will discuss it later."

After more amenities and a meal, Boris got to the point. "Guig, my present career is in danger."

"What's your career? Aren't you a general any more?"

"Yes, but now I head the junta in control of science."

"What d'you know about science?"

"Nothing. That's why I need help from the Group. Eric, Hudson and the Sheik couldn't deliver, so here I am."

"Proceed slowly."

"Guig, you've got to go back to Mexifornia."

"The hell you say. We've been here for a month and I've never been happier."

"May I give you entire picture?"

"Please do."

"Our Rasshyrenye computer in—"

"*Estop*. What's Rasshyrenye?"

"You would say 'Expansion' in

XX. Expansion computer. Equivalent of your Extrocomputer."

"Got it. Go ahead."

"—in Mockba is behaving V badly."

"I don't blame it. I never liked Moscow."

"Please, Glig," Natoma said. "Be serious." She knew how to say my name by now but she clings to her original pronunciation. Adorable. "He is always too flippant, Boris."

"Sorry. Go ahead, Boris."

"Our Expansion has always been well-behaved but lately has been acting up like a colt in a field with a birch tree."

"How?"

"It rejects problems. It rejects programming."

"All?"

"Just some, but it seems to want to set up in business for itself. And I am held accountable."

"I have a ghastly inkling of what's going on."

"Let me finish, Guig. Other computers in Kiev and Leningrad are behaving in same strange way. Also—"

"Also computer-controlled operations are breaking down, yes? Your subways, railroads, hovercraft and linears are running crazy. Assembly lines in factories are mad. Communications, banking, payrolls, mines, mills—all the same thing. Yes?"

"Not always but too often. Yes. And I am accountable."

I sighed. "Go on."

"Also fatal accidents have increased by two hundred percent."

"What!"

"The machines seem to be murderous. One thousand four hundred deaths last month."

I shook my head. "I never expected them to go that far."

"Them? Who?"

"Later. You finish first."

"Perhaps you won't believe this, Guig, but we suspect that our Expansion computers are in touch with your Extro at Union Carbide."

"I believe it and I'm not surprised."

"And taking orders from it?"

"Repeat, I'm not surprised. There's an entire electronic network around the world taking orders from the Extro. Yes?"

"We suspect so."

"What led you to that?"

"Several times our Expansions have printed out solutions to problems which had not been programmed into them. Later we discovered that they had been programmed into your Extro."

"I see. Y. It's an electronic revolt."

"Against what?"

"Against men."

"But why? How?"

I looked at Natoma. "Are you strong?"

"Yes, and I know what you are going to say. Say it."

I looked at Boris. "There's a new addition to the Group."

"Dr. Sequoya Guess. A most distinguished scientist and master of

computer-craft. That's why I am looking for him."

"My wife is his sister."

Boris bowed. Natoma said, "Not to the point, Glig. Please go on."

"When Guess went through his transformation, a freak event took place. The Extro set up a one-on-one relationship with him—its bits and his brain cells. He is the Extro and the Extro is him. It's a fantastic interface."

Boris is quick. "You've not yet said what you want to say."

"N," Natoma said. "He tries to protect me. My brother gives the orders."

"*Borjemoy*!" Boris exclaimed. "Then we must deal with the man."

"Not I, my friend."

"Why not?"

"If you don't know where he is, how should I?"

"You must find him."

"He's tuned in on the entire electronic network surrounding us. He'll know everywhere I go and everything I do. He'll have no trouble hiding."

"Then you must be devious to reach him."

"You're asking me to start a widdershins search."

"You put it precisely, Guig. Any more excuses?"

"You know I recruited him for the Group."

"With the help of Borgia. *Da*."

"You know the Group always supports its members, for better or worse. We are the family."

"You imply that dealing with Dr. Guess will involve attacking him?"

"Not only is he of the Group, he's my brother. He's also the brother of my beloved wife."

"Do not try to use me, Glig," Natoma said.

"I'm merely presenting the emotional dilemma facing me. There's another aspect. He and the Extro, between them, contrived to kill my adopted daughter, a darling girl who adored him. A girl I loved."

"In the name of God! Why?"

"She knew too much and I talked too much about what she knew. So now I'm torn by a love-hate relationship with Guess, and I'm afraid to move."

"It sounds like Chekhov," Boris muttered.

"And there's a final factor. I'm afraid of him. Genuinely. He's declared war on man. He and the electronic network have begun that war—witness the death-rate."

"Why on man? Does he propose a population of machines?"

"No. Hermaphrodites. His vision of the new breed."

"Impossible!"

"He has three already," Natoma said.

"They cannot exist."

"They do now," I said. "And as he murders men he will replace them with more. I think that's the Extro speaking through him. Men have been hating machines since the Twentieth Century; it's never

occurred to them that machines might return that hatred. That's why I'm terrified, Boris."

"It is bad, but it is not enough to account for extreme terror. You are still holding something back. What is it? I have the right to know."

I let out a sigh of defeat. "R. I am. The Greek figured out that there's a renegade Moleman working with the Extro; maybe with Guess, too, for all I know."

"Impossible to believe."

"The Greek's evidence and deduction can't be argued. There's a Moleman who's declared war on the Group."

"Who?"

"Not known. You're right, Boris. A baby Moleman and a stretch computer in collaboration are bad, but not terror-making. Add a renegade Moleman running amok against the Group with centuries of knowledge, experience, wealth, hatred . . . That's pure panic for me, and that's why I want no part of the disastrous mess. Let a Group hero-type take it on. I'll outlive it if I can keep under cover, which I have every intention of doing."

"And your beloved wife?"

"W?"

"Will she outlive it?"

"You crafty cossack son-of-a-bitch! All the same my answer stands. I won't tangle with him or any or all three of them. I'm no hero."

"Then I will, alone," Natoma said grimly. "Boris, you please take me to Mexifornia on your way home. If you can't, I go myself."

"Natoma—" I began angrily.

"Edward!" She cut me off in the peremptory voice of the daughter of the most powerful Sachem in Erie.

What could I do? She had the Indian Sign on me. I surrendered. "All right. I'll go. I'm just a squaw man."

Boris beamed. "I will now sing Rubinstein's 'Persian Love Song' in honor of your beloved, beautiful, valiant wife."

"If we can find the music room," I grumbled, reaching for the map.

10.

Then came the unexpected epiphany of Hillel, the Jew; saturnine, sephardic black and white, and twice as smart as the rest of the world put together.

As Natoma and I came out of customs in the Northeast Corridor (Brazil has no franchise to put down in Mexifornia; don't ask me why) there he was with the live and mecho porters. He answered a signal I never made, fought to us, picked up our luggage and hustled us to a pogo. When I started to greet him he shook his head. As he put us in he mouthed, "Tip." I tip. He growl in disappointment and disappear. He reappear in a different coverall as the pogo hackie, demanding in a debased Spang where we had the nerve to want to go. When I told him he started a fight

for extra fares. I've never been so abused in my life, and hot-tempered Natoma was ready to slug him.

"Cool," I soothed her. "This is typical of the Corridor. It's all a rage trip."

Hilly passed me a note. It read: "Careful. You're monitored. Will contact soonest." I showed it to Natoma. Her eyes widened but she nodded in silence.

We made the hotel in three jumps and damn if Hillel didn't start another fight over the tip. The concierge rescued us and escorted us through the security barriers, followed by the Hebe's screams of outrage. Beautifully in character. Chronic fury was the Beau Ideal of the Corridor.

We took a suite with water, both hot and cold, an extravagance that melted the desk clerk's snarls. The Corridor suffered from a perpetual water shortage. Most of it was black market and you had to pay through the nose for it. In the Corridor you didn't ask a girl to come up and see your etchings; you invited her to come up and take a shower.

So we took our showers, which made me feel like a deliciously dirty old man, and while we were drying off the floor steward came in carrying a couple of leather gun cases.

"The shotguns you ordered, sir," he said in affected hotel Euro. "Over-and-under 410's. Lady size for modom. Box of shells in each case."

I started to deny everything. Then I saw it was the Jew again and shut up.

"Sunrise tomorrow morning on the Heath. Five-thirty ack emma," Hillel continued suavely. "The club has agreed to release twenty chickens. Most generous. If you will permit a suggestion, Mr. Curzon, one would be advised to offer a generous bonus."

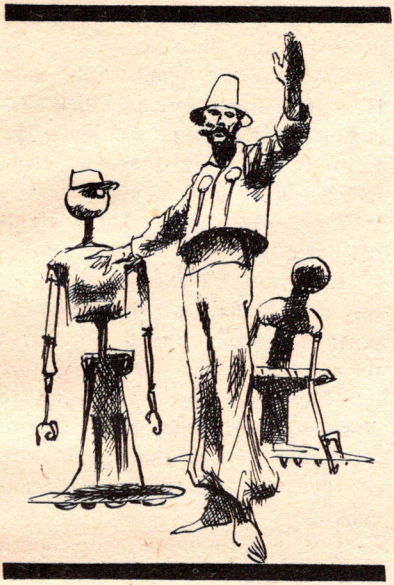
"Chickens!" I said incredulously. "No grouse, pheasant, partridge?"

"Impossible, sir. Those are extinct species in the Corridor. They could be imported from Australasia but that would take weeks. However, the chickens have been bred for cunning and guile. You and modom will have a fine morning's sport."

A range Safety Officer came up to us on the Heath while we were waiting for sunrise and the birds. He wore brilliant protective crimson and I thought he was going to ask to inspect our permits. Then I saw it was Hillel again.

"Gottenu!" he groaned, sitting down on the concrete. It was called "The Heath" only by courtesy. It had been a jet port centuries ago; square miles of concrete now owned by the gun club. "I had to walk it. Sit alongside me, Mrs. Curzon. Otherwise if Guig introduces us I'll have to stand up, and I don't think I can make it."

"Walked!" I exclaimed. "Why?"



"Taking no chances. The Extro network is damned thorough, which is why we're meeting here where we can't be monitored. Good morning, Mrs. Curzon. I'm called Hillel, the Jew."

"What is Jew?" Natoma asked curiously.

The Hebe chuckled. "If only that question could have been asked five centuries ago, what a difference it might have made for the Chosen People. It is an ancient race and culture that predated Christianity, Mrs. Curzon."

"What is Christianity?"

"I like this girl," Hilly said. "She has exactly the right gaps in her education. Bird, low, at ten o'clock, Guig."

I shot and missed on purpose. I hate killing creatures.

"You seem to be everybody everywhere," Natoma said. "What is it you do?"

"He's a professional Inductor," I said.

"I don't know that word, Glig."

"I invented it especially for Hillel. He's a genius of induction. That means he can observe and appraise separate, apparently unrelated facts, and add them up to a conclusion about a whole scene that hasn't occurred to anyone else."

"You're too complicated for her, Guig. Put it this way, Mrs. Curzon. I see what everyone else sees, but I think what no one else has thought. Bird, two o'clock, coming over fast. Try to bring yourself to get a few, Guig, to keep up appearances." You see? He knew I was missing on purpose. Acute.

"I think I understand," Natoma said. "My husband told me you were the smartest man in the world."

"When did he say that?" the Hebe demanded savagely. "I warned you to be careful."

"He did not say, Mr. Hillel. He wrote a note. We have been mostly talking by note."

"Thank God." Hilly was relieved. "For a moment I thought I'd had the shlep out here for nothing."

"But is being an Induction a profession, Mr. Hillel? How?"

"I'll give you an example, Nat," I said. "He was in a dealer's gallery in Vienna where they had a Claude Monet displayed. Something about the painting seemed odd to him."

"It ended abruptly at two edges," Hilly explained. "Bad composition."

"Then he remembered another Monet he'd seen in Texas. In his mind's eye he put edges together. Two of them fitted exactly."

"I don't understand yet," Natoma said.

"It's a crooked practice of art dealers to take a large canvas by a high-price painter, cut it up into pieces and sell each piece as a complete work."

"That's not honest."

"But very profitable. Well, Hilly went on a treasure hunt, found and bought the rest of the pieces and had the original Monet restored."

"Also V profitable?"

The Hebe laughed. "Y, but that wasn't the real motive. Actually it was a case of being unable to resist the challenge. I never can."

"And that's why you're here, Hilly," I said.

"There, love. He's as smart as he thinks I am. Perhaps more so."

"But always too flippant."

"So I have noticed over the years. He refuses to dedicate himself to anything; he prefers to make jokes. *Gottenu!* If he would only be serious as life requires now and then, what a tremendous man he would become."

I resented that and took it out on a chicken at eight o'clock.

"Give me the gun," Hilly said. He potted four more in quick succession. "That ought to keep the Extro from asking questions. Now let's get down to business."

"First, how do you know about the business?"

"Induction by the 'Inductor.' I was in GM City on the trail of a vintage Edsel when I got word from Volk—he's a dealer in rare coins and stamps in Orleans—to come quick. He'd located a strip of six British Guiana one-cent stamps of 1856. All still attached. Uncanceled."

"I didn't know they made stamps that far back."

"They didn't make many, which is why one 1856 Guiana is priceless. A hundred thousand easy. A strip of six attached and uncanceled is worth—oh—as much as you are."

"What! Collectors are crazy."

"R. I was immediately suspicious and requested confirmation of the message. Radex confirmed. I sent an inquiry to Volk. No reply. I asked Radex for confirmation of delivery. Confirmed. So I split for Orleans and saw Volk. He denied everything and I knew I was on the track of something."

"What made you suspicious in the first place, Hilly?"

"Back in those primitive days they engraved and printed stamps in batches of sixteen; four by four.

A strip of six was ip. fac. phoney."

"My God! Talk about acutedom."

"When I got back to GM I was thinking that maybe another collector was trying to spook me off the trail of the Edsel. Then Radex sent an apology and a refund. Mistake in transmission. It should have read sixteen 1856 British Guiana stamps, not six. Now my blood began to boil."

"On what grounds?"

"Volk and I had our conversation alone in his atelier. No one was there, but we were overheard."

"Volk is bugged."

"No doubt, but what the hell do the *politzei* know or care about rare stamps?"

"The price."

"Never mentioned."

"Um."

"We were overheard by something else and it was trying to cover up a bungle. A third attempt was made to lure me out of GM but I won't go into details. It was a challenge I couldn't resist. I did what the cossack couldn't do; tracked down the Group, all dispersed by fake messages."

"Why?"

"Later. I found out about the Extro network, Dr. Guess and the whole damned lunatic conspiracy."

"The Group knows?"

"More or less. I got the hard data from Poulos."

"Where is he? Also dispersed?"

"No, trying to track down the renegade. Yes, the Greek told me about that and I agree with his assumption. It's a dangerous mishmash. Crucial. He or she has got to be destroyed before the Group is destroyed. No one of us alone is a match for him, and that's why I think he had the Group scattered . . . to pick us off, one by one."

"Any idea who it might be?"

"Not a clue. We've got an average proportion of rotten members. Take your pick."

"Just one thing: Are you saying the Extro can make mistakes?"

"I thought you were above blind computer worship, Guig. Yes, they can make mistakes and so can the Extro's collaborator, Dr. Guess. Even between them they can make mistakes, and that's how we're going to find Guess and his three freaks. What d'you think, Guig? Are they equipped with a putz and a twibby? Both?"

"I don't know, Hilly, and I don't want to find out. It gives me the chills."

"When we locate Guess we'll find out. Now, we have a three-pronged attack. Guess and the capsule are somewhere here on Earth."

"They might be in orbit."

"Not a chance."

"Expound."

"He lofted the capsule out of U-Con after it killed your girl. Houdini and Valentine took off. You were in shock. The capsule went up and nobody noticed."

"Into orbit?"

"How? He needed a rocket vehicle for that and he had none. The capsule must have gone up as far as repulsion would take it and then drifted."

"Why not fall down?" Natoma asked.

"It had gas jets to maintain attitude in space. Evidently they were enough to keep it up and take it to wherever Guess wanted it. So he's on Earth somewhere. Now the three prongs. Mrs. Curzon, you will inquire about your famous and distinguished brother everywhere. You love him and you're worried about his disappearance."

"I am, Mr. Hillel."

"I believe you and so will everyone else. You will make a pest of yourself. Force people to avoid you as the plague. Send constant messages to Guig reporting progress."

"But if there is none?"

"Then use your imagination. We can send fake messages too. Everything you do will reach your brother by the network. It may draw him out to reassure you."

"I understand. I hope so."

"Guig, yours is more technical. How much gas was available in the capsule? How far could it go?"

"It had full tanks of compressed helium."

"Hm-m-m. Anyway, you'd better diagram that. Check UFO sightings and reports; a space capsule is an unusual sight here on Earth. Dr. Guess will need power to maintain the capsule pressure and refrigeration. If he's concealed, the solar vanes can't charge the batteries. Check every energy source within your plot for a new demand or drain. And here's a tricky one. What if the cryonauts develop no further than infancy? Mature in body; infantile in mind."

"My God! I never thought of that."

"No one else did."

Natoma said, "Boris told us he was reborn with all memory and skills after CNA-drone."

"DNA-clone, darling."

"Thank you, Glig."

"Not the same thing, Mrs. Curzon," Hilly said. "Guess will have to train and educate them, first of all in speech. Check every supplier of educational modes for retarded children who are autistic. Address of every order received in the past month. It's a drag, I know."

I shrugged that off. "And the third prong?"

"Mine. The hardest of all. Why were three separate attempts made to get me out of GM?"

"But Guess and the Extro have been dispersing the entire Group."

"True. They're afraid of us. But they could have gotten me out of GM by leading me to the Edsel. Why didn't they? Perhaps the car doesn't exist. A possibility. Perhaps they made a mistake in their estimation of my character. A possibility. But I'm looking for a third possibility."

"Which is?"

"I have no idea. I don't even know if it exists."

"What do you think, Hillel. Is Guess a monster?"

"N. N. N. The Extro and the renegade are the monsters. Unfortunately we must counterattack through Guess, who's merely a bad boy."

"Bad boy!"

"I repeat, bad boy. He's dealing with breathtaking discoveries and he's as drunk as a kid in love for the first time. I don't fault him for that. It's so unusual it would intoxicate anyone."

"Then what can we do?"

"Sober him down. Basically he's a good boy; a frightful nuisance now but no source of lasting danger. Keep your sights on the real evils, the Extro and the renegade."

"Are they an intimate commingling, too?"

"*Quien sabe?* Now we must break this up, alas, and go to work, each of us independently. No more of the mama-papa shoot, Guig. I'm sorry but you've had your honeymoon. Remember, you must Telex and Radex to each other constantly, but no message sent or received should be believed. Ignore them."

"But what if—"

"There is no 'what if.' You told Boris this would be a widdershins chase. So it is. Lie to each other. Fabricate. Be outrageous. That will throw the network into fits wondering whether you're using a code it can't break. And always remember it will be fabricating phoney messages too, so believe nothing and go on with the chase. The three of us operate alone. Understood?"

"Y, sir."

"Gung. Give me a half-hour start. Delighted to have made your acquaintance, Mrs. Curzon. Don't forget to collect your chickens, Guig."

"Don't forget Sequoya is my brother," Natoma called.

The Jew turned and smiled. "More important, he's of the Group, Mrs. Curzon, and we're always extra kind to our *meshugenehs.* Ask your husband what we went through with barking Kafka." Then he was gone. Acute and fast.

"Kafka?" Natoma asked. "Barking?"

"He believed he was a colony of seals. Will this concrete be too hard on your back?"

"Yes, but not on yours."

So we gave Hilly his half hour and I did remember to collect the chickens.

SIX-FOOT LEMUR DISCOVERED IN MADAGASCAR. LIVING FOSSIL. NOTIFY YOUR BROTHER. URGENT.

SEQUOYA REPORTED ON THETIS.

TELFORD SAYS YOUR BROTHER WORKING ON CURE FOR ASTHMA IN

GRASSHOPPERS. CAN CONFIRM? MAY MEAN NOBEL PRIZE IF HE CAN LOCATE ASTHMATIC GRASSHOPPERS.

N CONFIRM. HAVE HEARD HE HAS JOINED INCA CULT IN MEXICO.

EDISON SAYS YOUR BROTHER AND CAPSULE IN ORBIT. SAYS GUESS FEELS LIKE A BRASS MONKEY. N BELIEVE EDISON.

SEQUOYA NOT IN MEXICO. WHAT ARE YOU DOING IN P&G?

MUST BE MISTAKE IN TRANSMISSION. N P&G. AM IN TINKER TOY. YOUR BROTHER CLOSE BUT ANCHOR ICE MAKING SEARCH DIFFICULT.

URGENT. COME AT ONCE TO GARBO. HAVE BROKEN MY HIP.

SO SORRY. N LIKED YOUR HIP. ON MY WAY TO SEE GUESS IN SAN MIGUEL ALLERGY.

RESPECTFULLY REQUEST DIVORCE.

BRINGING COUNTER-SUIT FOR THE ACT OF PHLEBOTOMY COMMITTED WITH YOUR BROTHER. HOW DID YOU BREAK YOUR HIP IN GARBO?

N GARBO. AM IN DIETRICH. HIP UNDAMAGED.

YOUR BROTHER TELLS ME CAPSULE SAFELY HIDDEN BUT N SAYS WHERE. HAS HE TOLD YOU?

IN LOVE WITH EVIL ECZEMA. RESPECTFULLY REQUEST YOUR SUICIDE. MY BROTHER TELLS ME NOTHING.

URGENT. INFORM SEQUOYA ANOTHER LIVING FOSSIL SIGHTED IN CANASKA. A DINAHSHORE. IT IS GERMAPHRODITE.

URGENT. P SEND CREDIT. HAVE BEEN BILLED BY TRACER ASSOCIATES FOR EXTRA 1110110011 MILES COVERAGE RESULT OF YOUR MESSAGES.

IMPOSS. 1110110011 MILES IS TO THE SUN AND BACK. IS THAT WHERE YOUR BROTHER IS NOW?

CORRECTION. N MILES. KILOMETERS.

REPEAT: STILL TO SUN. IS YOUR BROTHER IN ORBIT WITH CAPSULE?

CORRECTION: USED BINARY INSTEAD OF DECIMAL. FIGURE SHOULD READ 947 MILES. Y. SEQUOYA AND CAPSULE IN ORBIT.

The Jew was right as usual. We had the Extro network throwing fits; distorted transmissions, phoney messages, dumb corrections. Meanwhile I was pursuing the course he'd plotted for me. The capsule was up to its ass in gas, enough to take it as far as Houston, Memphis, Duluth, Toronto. No point in mapping that. There had been a dozen UFO sightings in Nevahado, Utoming, Iowaska and Indinois. Also Hawaii. That was a bust, too.

I did just about as well on the energy drain. After half a dozen consultations with the enclave I discovered that they no longer tried to trace the thefts. It was cheaper to add it all up and charge everybody a surtax to cover it.

Ah, but the Autistic Instruction Modes! That was the hot lead. A barrage of orders for crash-courses had come in to the branch offices from something calling itself The Neo School. The orders were forwarded to the main office in Tchicago which, alone, knew where to deliver them. There was a strong chance that this was Hiawatha and his three baby *machisbians.* I would have to go to Tchicago and do some snooping.

But in the course of all this it dawned on me that while I was tracking the Chief I was being hounded myself. It started small and built. Salesmen from private composts paid calls. Wedding cakes in horrid glowing neon were delivered COD; also beds, clothes, carpets, spirits, acids and belts for hernia. I began to receive bills from physicians for absent acupuncture, and confirmations for bookings to Venus, Mars and the Jupiter and Saturn satellites, all luxury class.

Then it got worse. You add human worship of computers to an electronic revolt and you have a rough scene. There's nothing the damned machines can't do when the humans bob their heads and take infallibility for granted. At least the Druids worshipped trees, which are sensible and trustable. You can't corrupt a tree.

Six criminal indictments were filed against me by the Provocateur General's machine. Followed by announcements of my death by suicide over Solar Press Interplanetary wires. Then my passport and credit cards were revoked as counterfeits after routine computer review. I was now a man without a country.

My seven banks and brokerage houses informed me curtly that their accounting print-outs indicated I was heavily overdrawn. No further courtesies could be extended. I was now bankrupt. Then my former home—now the Chief's—burned to the ground. I'd taken the precaution of moving every treasure from the tepee to the house

for safekeeping. All destroyed or stolen. I spent the night sifting through the cold ashes looking for a fragment of memory. The looters had been before me and left nothing but their excrement and an odd weapon which must have been dropped unnoticed in the excitement. It was a short dagger with a broad, pointed blade. The handle was two parallel bars joined by a crosspiece. I slid it into my boot. It might help me locate the looters and recover some of the stolen things.

I would have given up that night if I hadn't had a vivid image of how Hillel and Natoma would ream me out. That gave me Dutch courage. So next morning I cashfared onto a linear bound for Tchicago. It was hijacked to Cannibal, Mo. I was transferred along with the other passengers and many bewildered apologies to a linear bound for Tchicago, and this time we were jacked to Duluth. Transfer and confusion again ("These are all computer routed and piloted!") but this time the jinx was smart. So they wanted to keep me away from Tchicago? R. I transferred to the Buffalo shuttle and made it.

So here I was at the far end of the Erie Reservation and this time I had a break. The gate was guarded by a Cherokee tour of duty and one of them was a totemic relation who recognized me. He grinned, knocked his fists together four times, put me in a chopper and lofted me to the Guess marble wickiup.

I must have looked awful. Mama stared at me, burst into tears and swept me into her billows. Then she stripped me, bathed me, put me to bed and fed me a broth that lined my ribs. I never had a mother like this. I loved her. An hour later stately papa came in accompanied by a goblin—all head and not nearly enough body to go with it. Slavic eyes and high cheekbones. A character out of "The Hall of the Mountain King."

"Like *bwenas tarthes,* man," the goblin said in mellifluous Spang. "How *esta* you?"

"I'm more comfortable in XX," I said. "Do you speak it?"

"But of course. I am Larsen, Professor of Linguistics at the college. You're not ill, I hope, Mr. Curzon."

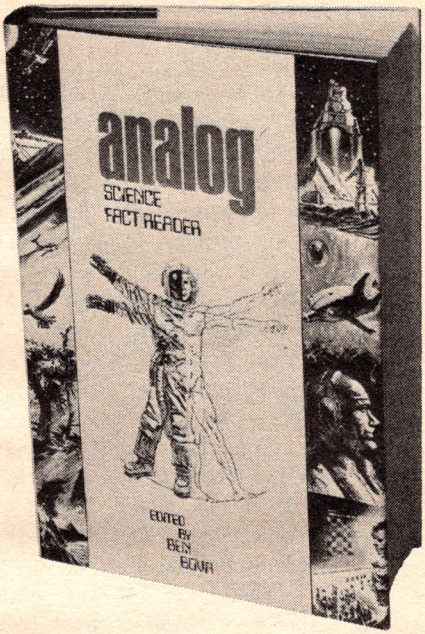
"Just tired, spent, exhausted."

"The Sachem asks first about you, his new son. I will tell him." He told papa in Cherokee. Papa shook his head and clicked his tongue. "Now he asks about his other son and daughter."

"Both are alive and well, to the best of my knowledge."

"That is ambiguous, Mr. Curzon."

"I'm aware of it, Professor Larsen, but the facts are so complicated it would take the rest of the day to explain. Just say alive and well and happy."



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After a palaver the goblin said, "The Sachem asks why they are not with you."

"Tell him I'm on my way to join them."

"And this is a courtesy call?"

"Yes and no."

"Ambiguity again, Mr. Curzon."

"It's part of the complication. I must borrow some cash."

"But you are reputed to be a millionaire many times over, Mr. Curzon."

"And so I am. Again more complications."

"I must hear them. I have never been so tantalized. Excuse me." He turned and quonked with papa. Then back to me: "The Sachem says certainly. Of course. How much will you need?"

"One hundred thousand."

Larsen was startled; not so papa. He nodded calmly and I loved him. I never had a father like that. He left the room and returned with ten neat packets of gold-colored notes, meaning they were thousands. He stacked them on the bedside table, sat down on the bed and peered into my face. He put a hand on my brow and murmured.

"The Sachem says that despite your fatigue, marriage to his daughter seems to agree with you."

"Please tell him that she has become more beautiful than ever."

"I had better not, Mr. Curzon. On the reservation it is regarded as unmanly to admire one's squaw."

"Thank you, Professor Larsen. Tell him that Natoma is a hard-working squaw."

"That should please him, I think."

The door burst open and the hard-working squaw charged into the room, looking like an agitated goddess . . . that is, if the gods ever were chic. She threw herself on top of me. "What is it, Glig? What is wrong? Why are you in bed? Am I hurting you? Why are you here? Where should you be? Did you know I was coming? How? Why don't you say something?"

When she gave me a chance I said something, and managed to ask her what she was doing here.

"I had to come," Natoma said, "I had to reload with sanity. I've seen my brother and I'm furious."

I was dying for her news but there was no more time for talk; dinner was waiting. Papa, the professor, the kid brothers and myself at the table while mama and Natoma waited on us. My incomparable wife had the charm to revert to tradition on the reservation. She wore deerskin, kept her head lowered, and actually blushed when the naughty boys made coarse marriage jokes which Larsen refused to translate.

When I signed to her to come out with me for an evening walk she nodded but gave me a wait signal. She had to help mama with the dishes. When at last we left the wickiup she walked three humble paces behind me until we were out

of sight. Then she threw herself at me and nearly knocked me down.

"I love you. Oh, how I love you. I would love you if you were hateful. You've rescued me from all this."

"You would have rescued yourself, Nat."

"How could I? I never knew there was another world. No, you liberated me and now I'm entire."

"And so am I. It works both ways."

She took me to her childhood hideout, a giant Cedar of Lebanon in which we could climb up, sit close and hold hands without caustic comment from the Erie conservatives.

"Who goes first, you or me?"

"You."

"Mr. Hillel was right. My brother came looking for me."

"Where did he find you?"

"In Boxton."

"I never knew you were there."

"The machines were keeping us apart."

"Yes. And? Did he try to reassure you?"

"No. He frightened me. He's not just a bad boy; he's cold, cold, cold. Heartless."

"Ah."

"He's not my brother anymore."

"Not now, but he will be again."

"He told me that it was cry havoc for the human race, which had been asking for it for a thousand years. Death and destruction. No mercy."

"Dio! We know he and the network mean it."

"He told me to go home where I'd be safe. The network can't get through to the reservation. There are other places, too. Sahara and Brazil and—and—I forget because I wasn't listening."

"Why not?"

"I lost my temper. Why are you grinning?"

"Because I know that temper."

"I told him he was a traitor to me, to his family, to his people, to this entire beautiful world you've shown me."

"Hoo boy. You were hot."

"I was. I told him I wasn't a squaw any more; that you had turned me into a thinking, independent person, and that I would do everything I could to stop him and punish him, even if it meant getting the Erie tribes and nations to hunt him down. If they could beat the Mafia International they would have no trouble with him and that damned computer on his back."

"Pretty strong stuff, Nat. Would the tribes and nations help?"

"They will. We've done without electronics for generations, outside of the fence and a few simple basics, so they can't be cowed by a computer. And most of them are dying for a fight anyway."

"Even against the son of the Great Sachem?"

"They won't kill him. They'll just roast him over a slow fire, Iroquois-style, until he comes to his

senses. That'll sober him down."

"Did you mention the real enemy, the renegade?"

"No."

"And what did he say to all this?"

"Nothing. He just turned and left me like you leave a piece of furniture."

"Going where?"

"I don't know."

"Back to the capsule?"

"I don't know. He left and I came home."

"Of course. And you'll stay here."

"N."

"Why N?"

"I want to be with you."

"Natoma!"

"Edward!"

We had it out so hard that I nearly fell out of the tree. I listed all the disasters wrought by the computer network. Nothing. Not even a tear for the Sevres destruction. She only looked grimmer and more determined. She had taken the ball from flippant old me and was set to run or pass, so I surrendered. My goddam Cherokee wife had the Indian Sign on me.

And she outsmarted the anti-Tchicago network. We took the Buffalo shuttle to Pittsburgh. Pittsburgh to Charleston. Then it would be Charleston to Springfield and Hovercraft to Tchicago. But someone must have slipped up on Natoma's passage vouchers. The Charleston travel desk paged her just before takeoff. Her Spang wasn't nearly as good as her XX, so I took her tickets and went to the main desk to find out what the tsimmis was.

I reasoned with the smart-asses and they argued back—computer check (infallible) indicated the tickets were faulty. I planked down a gold-colored thousand and asked for a new voucher. Quick, please. They quick, but the automatics took over and the shuttle lofted while I was waiting. A hundred feet up it burst into an explosion that shattered it, smashed the walls of the port building and knocked me into oblivion.

TO BE CONCLUDED

SEPTEMBER, 1974

THE ANALYTICAL LABORATORY

Place	Title	Author	Points
1.	The Raven and the Hawk	*William Rotsler*	2.43
2.	Whale Song	*Terry Melen*	2.68
3.	The Mazel Tov Revolution	*Joe Haldeman*	3.11
4.	All Which It Inherit	*Bernard Deitchman*	3.70
5.	Black Fly	*George Ewing*	3.85
6.	Touchplate	*Alan Brennert*	4.90

the reference library

P. Schuyler Miller

KALEIDOSCOPE

Dr. Frederic Wertham is the New York psychiatrist who has spent more than a quarter of a century in a personal war against violence in our society, and especially in the media that our society places before its children. His "The Show of Violence" came out in 1949. "Seduction of the Innocent," attacking crime comics ("comic books that depict crime, whether the setting is urban, Western, science fiction, jungle, adventure, or the realm of supermen, 'horror', or supernatural beings") is probably his best known book. "A Sign for Cain" (1966) is the most recent I have seen.

But Dr. Wertham's latest book doesn't view the media with alarm at all, and in any case Robert Bloch has summed that situation up in a very few words in his introduction to Volume 3 of Walt Lee's great "Guide to Fantasy Films": "To me, the most frightening thing about today's cinema is the reaction of its audience; the cruelties which once caused chills now evoke laughter and sadistic satisfaction." This is what Dr. Wertham has been talking about for twenty-five years in his books, his articles, lectures, TV and radio interviews.

Now he has discovered science-fiction fanzines . . . and he's delighted.

"The World of Fanzines" (Southern Illinois University Press, 144 pages, $10.00) is a perplexing book, almost impossible to sum up. The author's dedication to antiviolence doesn't make it any easier to understand, for violence is not unknown in SF and its corollary forms of fiction. Why fanzines?

I can tell you what he says: "Having seen, in my years in psychiatry, so much of the general flaws in our human relations, I was attracted to something that was so positive and was not acknowledged as such. I felt that it was essentially unpolluted by the greed, the arrogance, and the hypocrisy that has invaded so much of our intellectual life." And again: "Behind much that appears as free expression in strictly commercial magazines and publications we have to visualize some 'stone-faced business tycoon.' Those whose names are printed as creators may be more like marionettes, with the guiding threads invisible—though every once in a while the threads show. Whatever one may think about fanzines, they are not guided in any way by such invisible threads."

One finishes the book with the feeling that for all his years of experience as a psychiatrist, Dr. Wertham is rather naive when he is confronted with the kaleidoscope of fanzines. I don't think he sees past fanzines to fandom, and I'm not

sure he has read Sam Moskowitz' "The Immortal Storm," though he mentions it. He seems unaware that science-fiction fanzines are not the first spontaneous literature of their kind. (H. P. Lovecraft wrote for 'zines in an earlier, less specialized cycle.) He probably hasn't seen the letter columns of the pulp magazines—letters from adults as well as adolescents—and so finds fanzine letters novel.

The book is, after all, published by a university press and is written for Dr. Wertham's peers in the academic world. His discoveries of facets of science fiction and fanzines, that most of us take for granted, will doubtless be discoveries to the people he is addressing. He has caught the dual elements of communication and community in a highly varied and complex body of people, which are a key to the understanding of fandom in any field—telescope-making, hiking, archaeology, bird-watching, fossil-hunting, film-buffing. He finds some of the essays in fanzines more valid and understanding than some professional criticism. On the whole, for all the emphasis on action in much SF ("Many people have been led to the mistaken belief that action and violence are one and the same thing. However, there can be a great deal of action in life and art *without* violence."), he feels that it may well be healthier than mainstream books, plays and films.

The first half of the book is really a description of science fiction and fanzines Dr. Wertham has seen. There are lavish citations and quotations, from English and European 'zines as well as American. There is a glossary of fannish jargon, a bit dated. (Who was it who said of a clergyman's swearing that "He knows the words, but not the music"?) Then he gets down to his analysis.

I am not sure I know, even yet, what his conclusions are. (The fanzines will dissect the book better than I can; among other things, they know themselves better.) But I'll close with one impressive statement from the closing pages:

"They are a product of the society in which they originate. At the same time they are . . . whether intended or not, a reaction against this society. And . . . more importantly, they are a kind of reagent, minor though it may be, through which this society can be judged." He argues that fanzines should be recognized for these qualities and used by society to cleanse itself. I argue that this would destroy most of the unpatterned spontaneity that he finds good.

CASE AND THE DREAMER
by Theodore Sturgeon • Nelson Doubleday, Inc., Garden City, NY • 1974 • 152 pp. • $1.49+

The "Nelson Doubleday" imprint is the one Doubleday uses for its original hardback Science Fiction Book Club editions. A New American Library paperback is coming, but I haven't seen it yet. And the "+" with the price means that there are additional handling charges and taxes which depend in part on where you live.

All that said, books like this are the reason I finally had sense enough to join the SF Book Club. As a collector, I prefer original hardback editions when I can get them—but these are original hardbacks, and in many cases there may never be any other. Anyway, any book by Theodore Sturgeon is worth buying at any price.

There are three novellas here, all concerned with what the "new" SF people call "inner space"—with what people are like inside. In the title story Case, a spaceman, has died dismally, has seen his girl killed, and is brought to life in a new body by a "blue man" who is a surrogate for someone (or something) else. He learns that he can go back to the strange world where he was marooned, and maybe undo the past—but the story is why all this happened in the first place.

"If All Men Were Brothers, Would You Let One Marry Your Sister?" was in Harlan Ellison's "Dangerous Visions." It may have been daring in 1970, but in 1974 it lets down the middle of the book. The detail is lovely, as Charli Bux tries to find a hidden planet which the entire human machine seems pledged to hide from him. He finds it, and you will believe every moment of his quest, but the dark secret of Vexveltia is strictly ho-hum. You won't believe its assignment to limbo for a moment.

All three stories are variations on the theme of human love, and from planetary incest we go to another strange and strained variety in "When You Care, When You Love." The richest woman in the world finds her man—a nobody, but what she wants. And he will die of cancer in six weeks. So Sylvia Wyke orders her doctors to use the very nature of this strange kind of cancer to recreate her lover. This is "hard" biology with a vengeance, and Sturgeon makes you believe it.

As when did he not? Well, maybe in that second story.

FLOW MY TEARS, THE POLICEMAN SAID

by Philip K. Dick • Doubleday & Co., Garden City, NY • 1974 • 231 pp. • $6.95

Here is Philip K. Dick making like A. E. van Vogt of the "Null A" days, and doing it very well.

Jason Taverner, star of one of 1988's top TV shows, goes to the hospital after a cast-off starlet has attacked him with an ordinarily deadly Callisto cuddle-sponge—and wakes up in a fleabag hotel, stripped of every bit of identification but with a wad of money in his pocket. Little by little he finds that he doesn't exist. Nobody has heard of him or his show. His friends have never seen him. There are no records of his birth or life in the files of one of the nastiest police states you could ask to see. He uses his money to buy a set of forged ID cards—and is promptly betrayed to the police.

Now the focus changes, and we see the Taverner enigma from the point of view of the police. There *can't* be a man in their world for whom there are no records. If some tremendously potent underground agency can extract every mention of a man from a nation's files, they

want to find it and smash it—fast, the way they would treat the "students" who burrow under the ruins of the old universities, or the unreliables who die in labor camps. But Taverner is helped to escape . . . is drugged . . . and the nightmare begins.

I admit that I am still not sure just what KR-3, the police laboratories' multiple space inclusion drug, has done. Is the world where Taverner doesn't exist a hallucination of the poisoned TV star . . . or is his success a pipe dream of the nobody in the flophouse? What are the people who exist in both worlds, and how can they lead mutually exclusive lives and shuttle back and forth between them? How can a woman become a skeleton in moments?

I do not much like the book's Part Four, either. As if he were winding up a Victorian romance, Dick gives us a quick rundown on what happened to every major character and some minor ones. Poor Taverner, of course, has found the police state too much to buck—or was he a hallucination too? You decide.

FUTURE CITY

edited by Roger Elwood • Trident Press, New York • 1973 • 256 pp. • $7.95

In his account of the "Elwood phenomenon," in last May's Analog, Barry Malzberg rated this as one of the best of the literally scores of original-story anthologies Elwood has assembled for a total spectrum of publishers. One of the best of the nineteen stories (and three poems) is Malzberg's own strange and ugly "City Lights, City Nights," written by his alter ego K. M. O'Donnell. (An Outsider uses the *lumpen* of a future city to enact the Kennedy assassination as an art form.) He also has the less disturbing "Culture Lock" under his own name: a city in which homosexuality has been institutionalized and is almost as deadly as heterosexual marriage seems to today's social explorers.

As the title tells you, all the contributors are writing about future cities—Thomas Disch a mood-setting poem, "In Praise of New York," and the others rather short vignettes. Ben Bova leads off with the chilling demonstration, in "The Sightseers," that it's a risky business to keep a city open more than two weeks out of the year. (I remember with delight the occasion when a tourist learned that the State of New York keeps some of the Adirondack mountains open all night.)

My own choice out of the book, though, is Thomas N. Scortia's "The Weariest River." It is the only novelette-length story in the lot—a grim and ugly account of the war between the young and the immortal old, who age and increase but never die. Never *can* die, in fact. Another winner, which may take the taste of the Scortia story out of your mouth, is Dean Koontz's "The Undercity," which illustrates some of the things an honest crook has to do to make a living on an ordinary business day. And there is R. A. Lafferty's quest story, "The World as Will and

Wallpaper," in which every neighborhood in a world-enveloping megalopolis is different. (When you read it, remember that William Morris designed wallpaper. Lafferty titles make more sense than you may realize.)

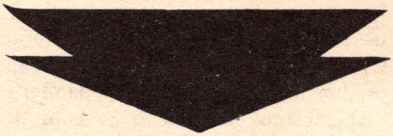
You can stand on the corner or lean out of the window in nearly any city and see the germs which many of the other writers have allowed to grow into stories. In Andrew Offutt's "Meanwhile, We Eliminate," a gas-burning monstrosity from across the Ohio ventures into all-electric Louisville, Kentucky—to its doom. In Laurence Janifer's "Thine Alabaster Cities Gleam," a man and his secretary quietly smother in their office when their city has a power blackout—no ventilation, no phones, doors won't open—and I don't believe a word of it. William F. Nolan's "Violation" strikes a note you can hear played every day in every downtown—a traffic cop simply executes traffic violators in an overcrowded underground city.

Harvey and Audrey Bilker's "Apartment Hunting" really speaks for itself—except that you may not have taken the handicap of the Geriatric Fair-Play Law into account. Frank Herbert's "Death of a City" has too logical a twist of truth in it, when a City Doctor condemns a city because it is too beautiful—and too static. George Zebrowski's "Assassins of Air" does speak for itself: smog extrapolated (a neighbor, a US Steel executive, assured me last night: "You can't do anything about sulfur . . . except close your window"). Joe L. Hensley's "In Dark Places" shows us a city with a real black ghetto that is everything it ever was in medieval Europe. Robin Schaeffer's "Revolution" asks who is human? Who is a robot? And Thomas Monteleone, in "Chicago," very effectively shows us a computer that is a city. It belongs up there with the leaders, too.

Robert Silverberg has written almost the only old-fashioned plot story in the book, but you know as well as I that there's nothing old-fashioned about a present-day Silverberg story. His "Getting Across" takes us into a city strangely like Lafferty's extended a century or so—a mosaic of hostile and militant neighborhoods that covers the entire world. One district has lost its computer's program, and as it begins to fall apart, a man goes to find the thief and get it back.

Ray Russell's "The Most Primitive" is certainly part of every city and has been for millennia—its cockroaches, who will survive when even the rats may not. Harlan Ellison takes us to the end of the Earth in "Hindsight: 480 Seconds," as the last poet, the last radio announcer, has his last word. Miriam Allen deFord sees a different end as mankind runs down in "5,000,000 AD."

I have passed over two more short poems by D. M. Price, "As a Drop," and Virginia Kidd, "Abendländes." If Disch's opener catches our New York in a mist-net, hers builds the future we all dread and see growing inexorably around us, "while the towns still empty, and the cities rot."



BRASS TACKS

Dear Mr. Bova:

I have been reading science fiction for over fifteen years, ever since I discovered the "space cowboy" type of novel in the children's section of the library. Now I am a twenty-six-year-old feminist, and I find that I get so angry with most of the new novels I read that even if the plot is gripping, I have to throw the book down.

There are still the old pound-the-hairy-chest writers around, from whom I expect no change in their treatment of women. It is more exciting to them to imagine women piloting space ships or computers and falling apart in crises or when the hero says the right words. I can still read that type of novel and laugh at the naiveté. But it is the supposedly thoughtful and skillful writers who continually disappoint me.

It is to be expected that portrayal of women in the present is likely to be as secretaries or housewives, even though these are admittedly stereotypes. Of course, there are hundreds of thousands of women doing more than that, . . . but after all, male writers writing about the present see things with their own prejudices.

But the future, about which SF writers are supposedly open-minded and innovative, is just as stereotyped as the present. Are we to expect that hundreds of years from now there will still be few female leaders, scientists or other authority figures, and apparently none that ever appear within the scope of the supposed action? Why can these reputedly farsighted authors, who can create new economic structures, rethink government and even dream up new fashions in clothing, still forget about half of the population? Why, when there *does* appear a woman in the center of a novel's action, does the author call attention to her sex with either a pat on the back to himself for remembering that it is possible for the leading scientist (that's always a safe occupation for a woman—very little real power) to be a woman, or show her melting in a crisis, sometimes not completely, but long enough to show a man giving her support? When will we see women as strong, capable people, unconcerned over male approval, and yet warm and real human beings?

There are a few writers today who make an attempt at a fair portrayal of women despite their social conditioning. It has been said that women are not usually interested in science fiction. I know enough women who are interested to know that such a generalization is a fal-

lacy. Hopefully you have received other letters in this vein. Perhaps after enough women speak up, the male writers will think twice before they next cast a woman into a stereotyped role.

CAROL C. DAWSON
106 Carr Street
Chapel Hill, North Carolina 27514

Or more women will contribute stories?

Dear Ben:

I have been persuaded to give up using my pen name, Tak Hallus, a name derived from the Arabic word *takhallus* meaning pseudonym. (If you're going to have a pseudonym, it should be self-explanatory, right? Or almost self-explanatory.) I have been considering doing it for some time, but a comment of Harry Harrison's, delivered with the reserve of a British aristocrat ("That pen name is *ugly, ugly, ugly*!"), tipped the balance. Sorry about any inconvenience the change causes.

STEPHEN ROBINETT

Adieu, Tak Hallus! Look for the Stephen Robinett byline in our February, 1975 issue.

Dear Mr. Bova:

Your Editorial on technology (September) was to the point. Let me relate additional evidence to the thesis that the way through our troubles (note that I do not say "out of") is a better appreciation of intelligent technology.

I am a mathematician and computer programmer. While in school I volunteered to teach for the free student university project—a *very* general course on mathematics—no theorems, definitions, computations, derivations or any of the more involved math—just the basic, everyday foundations such as more efficient ways to add, subtract, multiply, divide, use logarithms, understand word problems, et cetera. Sixth-grade stuff of which I have found ninety percent of the college students to be ignorant. I taught two semesters and had two students that stayed with it.

One student had the following reaction when I promised a tour of the campus computer facilities: "Ugh, I can't stand computers!" When I asked him why not, he replied, "They are so monstrous and dehumanizing." To which I can only reply:

Is a screwdriver dehumanizing? Maybe an automobile? Would you accept a ballpoint pen as monstrous? Nuts. Like any tool, the computer isn't dehumanizing or monstrous. The tool users must be blamed. And I do!

For the ten or so years I've worked with computers, I've been waiting for a development which has never happened. Ever hear people complain they are being turned into a number? Well, if you know anything about computers you realize how unnecessary numbers—as labels only—really are. In a modern data system, filing information by name is almost as easy as by number—and a lot more direct. Mostly we hang onto the numbers because that's the way somebody started it. It isn't the fault of the machine users. Ask any programmer—not one in a hundred users

understands even vaguely what a machine *does,* let alone what it *could do.* Using an IBM 370 for payroll is like using a Saturn V for a signal flare. It'll do it—but what a waste! . . .

LOUIS J. BOOKBINDER
860 Larkspur
Millbrae, California 94030
Amid all the worries about various "crises," very few people understand how much technology can do FOR us.

Dear Ben:

I have been an avid reader of Analog for over seven years. In all that time, I have never read a story with less reason to be in your magazine than "All Which It Inherit" by Bernard Deitchman.

I have come to expect your magazine to publish good science fiction. Mr. Deitchman's story was neither very well written, nor even science fiction. Fantasy perhaps, but still with little to recommend it save teleportation.

Many stories have overcome a weak thesis, but no writer could overcome no less than eight weak theses in one short story. I feel that (a) the comet's origin; (b) the comet's effect; (c) the piomdos origin; (d) the gray men's origin; (e) the white cube's origin; (f) the ignition of Jupiter; (g) the lack of effect of the ignition of Jupiter on Earth; and (h) the anti-matter universe were a bit much to even try to explain away, much less use as the basis of a story.

I do not wish Mr. Deitchman to take offense at my candid remarks. I just feel that his story was a bit of sloppy writing that slipped by due to sloppy editing. From what I have seen, I expect better from both him and yourself.

KELLY HARBESON
2002 W. Randolph Circle
Tallahassee, Florida 32303
New concepts often seem uncomfortable, but it's important to flex our mental muscles from time to time.

Dear Ben:

I must say, William Rotsler's most conspicuous and outstanding appearance in your September issue with "The Raven and the Hawk" proved to be a great piece of enjoyment for me.

Foremost, let me state that I previously had not been crazy for or overly excited about Rotsler's work . . . But this novelette has all but changed my consideration of his creative work in the science-fiction field. "The Raven and the Hawk" must become one of the best novelettes of late 1974 . . .

SCOTT C. SMITH
10418 Hayvenhurst Avenue
Granada Hills, California 91344
Rotsler is a multitalented man, and has surprised me more than once.

Dear Mr. Bova:

Oh my! You actually bought a story with the word "erection!" Goodness gracious! Pornography! Pornography!

Seriously, though, "Touchplate" should at least make the Nebula and Hugo ballots. A beautiful, polished diamond; my congratulations to Mr. Brennert.

As for "Black Fly"—can't we read about something other than

assassination attempts for once? Three in the past year, and "High Justice" came close. As for the victim turning out to be a robot—Dr. Asimov did it much better many years ago ("In a Good Cause . . ."), and twenty-five months ago in your own pages Gary Alan Ruse made the idea work with "Nanda." But Mr. Ewing didn't make it work.

A rereading of the last couple of pages of "Black Fly" convinced me not to dismiss it as worthless, but it still had just too many old ideas, treated inadequately.

Thank you again for "Touchplate," and in general for the excellent job you've been doing of late . . .

RICHARD S. HOLMES
306 Edwards Drive
Fayetteville, New York 13066

The point of "Black Fly" was that modern technology needn't be entirely *on the assassin's side.*

Dear Ben:

Well, Ben, the story "Touchplate" with its mention of a guy's erection at the sight of a scantily-clad woman ought to set the "decency freaks"—who are bemoaning the deflowering of the pristine pages of SF—to foaming at the mouth again.

I'm writing this in the hope that you will refrain from continuing to print their diatribes. Enough is enough. Ever since you've become Editor and have started printing stories with references to S*X, I guess you've felt some sort of obligation to give their crackpot ideas "equal time."

They've had their time. I'd rather you use the space to print more of the more intelligent letters, which you usually do a good job of.

For the benefit of Mr. F. L. Whittier of Bartlesville, Oklahoma, and other of the crank readers, I too am a long-time SF fan—for about twenty-five years. However, even though I am in the "older" generation, I for one don't think that exposure to S*X—even exposing kids to it—hurts anyone. Where in fornication does he think we come from? When are these people going to realize that kids and unmarried folk know about it, and (horrors!) sometimes even indulge in it? And that they're still going to know about it and do it, no matter how many Mr. Whittiers there are?

Sex is an important part of life. When mention of sex was a no-no, story possibilities were limited to that extent. The days when the hero chastely kissed his control panel and blasted off into the sunset are over. Thank the stars.

A psychological sidelight: Mr. Whittier, in his put-down of Haldeman's "Hero," transfers his aversion to sex to the "irate parents" of the kids he is trying to proselytize. I doubt if his efforts have been all that successful. I can see it now: "Here kid, read this or else; it's good for you." Better to risk the chance that the kids will *never* discover SF than the certainty they'll be turned off by associating it with the likes of Whittier who are the antithesis of it.

That is, here is Whittier, closed and dogmatic, trying to introduce a

kid to a genre that is open, speculative, and mind-stretching. Ridiculous, isn't it?

DAVID A. BEAN
PO Box 5356
Santa Monica, California 90405

Yes. And your suggestion is a good one. The discussion is closed, unless someone has something radically new to say on the subject.

Dear Mr. Bova:

Following Duncan Lunan's article on long-delay radio echoes (January 1974), your readers may be interested in a paper I have published in the July 1974 *Spaceflight,* the journal of the British Interplanetary Society.

In this paper, I took 31 reports of LDE from the 1927-29 period, and 61 amateur reports published by Villard (*QST*, February '70 and May '71), using all reports for which a precise date and time were given. For each report I calculated the positions of the Moon and its Trojan positions in the observers' skies. The early reports, mostly from Oslo at 60° N, gave a mean elevation for the trailing Trojan of +12.4°, which is significant at the 0.9995 level. Two groups of Villard reports gave mean elevations of +8.8 and +10.7°.

The Local Hour Angles of the trailing point also show a strong bias to the meridian, in 24 cases being within ±2 hours of upper meridian transit, and only 6 for the lower transit. Chance expectation is 15.3, standard deviation 3.57. Each of the three groups of reports taken individually gives a similar result. The results show a very strong correlation with the trailing point, the odds against a chance result being thousands to one. This is fully compatible with what one would expect if the echoes were caused by a spacecraft at the trailing point, although at this stage one cannot rule out alternative explanations. Work is continuing.

GEORGE SASSOON
Heytesbury House
Warminster, Wiltshire
England BA12 OHG

The evidence accumulates!

Dear Mr. Bova:

I was quite interested in the letter in your August issue from Mr. William G. Lamb regarding a resource guide for science-fiction teachers. While I quite agree with your response that there is no substitute for a teacher's in-depth study of the subject before he tries to teach it, nonetheless, such guides do serve as a starting point for even the good teachers. With that in mind, I would like to cite four items which readers of Analog might be interested in examining.

The oldest of the guides available was done by Jules Pfeiffer, titled "Fantasy and Science Fiction: A Critical Guide" (Palmer Lake, Colorado: Filter Press, 1971. 64 pp.). This guide provides a coded list of books giving topics such as racism, population problems, utopia, dystopia, future history, space opera and so forth . . . The second guide was done by Elizabeth Calkins and Barry McGhan, titled "Teaching Tomorrow: A Handbook of Science Fiction for Teachers" (Dayton, Ohio: Pflamm/Standard,

1972. 102 pp.). The primary value of this handbook lies in its brief synopses of two hundred recommended novels. It seems to be the best of the currently available teachers' aids.

The third book, by Bernard C. Hollister and Dean C. Thompson, is titled "Grokking the Future. Science Fiction in the Classroom" (Dayton, Ohio: Pflamm/Standard, 1973. 168 pp.). This is the book I recommend for a teacher of history, political science or a number of other subjects, who wishes to insert a small section of science fiction in the course as an interest item. It is divided into eleven chapters which cover such items as ecology, population, the automobile, et cetera . . . It is not a book for the English teacher who wishes to touch on science fiction. The final item I'll mention, by Beverly Friend, is titled "Science Fiction: The Classroom in Orbit" (Glassborough, NJ Education Impact, 1974). I have not yet received a copy of this book, but it is written by a person active in the science-fiction field who has been teaching science-fiction courses.

I'll note also that individuals who are interested in the teaching and research of science fiction should by all means join the Science Fiction Research Association. The Association is four years old and publishes a journal and a newsletter which are of interest to science-fiction teachers and scholars. Dues are $15 per year which brings *Extrapolation,* edited by Tom Clareson, and the *SFRA Newsletter,* which keeps members up to date on new books in the field, articles and reviews of historical and bibliographic books which appear. Individuals wishing to join the Association or find out more about it should contact Tom Clareson, SFRA, PO Box 3186, College of Wooster, Wooster, Ohio 44691; or myself.

H. W. Hall
3608 Meadow Oaks
Bryan, Texas 77801

There's also, of course, the monthly guide to modern science fiction: Analog!

Dear Mr. Bova:

I would like to reply to your "Citizens of the World" Editorial in the August 1974 issue of Analog. In an obvious attempt at pragmatic realism, you have shown an unrealistic skepticism which is most unbecoming to the editor of a science-fiction magazine.

Your main point seems to be that the multinational corporations are the only "world citizens" with enough power to cause the germination of the seed of global unification. This could not be farther from the truth, considering the fact that the dealings and policies of the "multi-nations" are responsible for much of the world's current anguish and divisiveness. Human progress and social freedom will be possible only when the people of the world demand strong and progressive central government and a greater voice in that government than massive corporate lobbies and payoffs . . .

The truth of the matter is that the seed of world unity is already

fertile and growing. If you will remember the concept of evolution, you will note that humanity has developed from clans to tribes to city-states to nations—no matter how impossible it seemed along the way—and it is foolish to think we should stop at this stage. As our race matures, the interaction of intellects can play a stronger role in directing our evolution . . .

There are more "citizens of the world" than just those fanatics who go through so much trouble to document it. Anyone who recognizes the common destiny of humanity and thinks productively about it is a true "Terran." I am sure that the SF community agrees with me on that.

I tend to expect insight and hope at least in the genre which is the language of modern philosophy. Thus, your apparent shortsightedness . . . is a bit disappointing.

Also, I tend to agree with certain other readers that the smart-ass flavor of your replies to many letters is a bit sour. But please continue with everything in your magazine, because you have a lot of entertaining and thought-provoking material in it. I would like to hear from other readers—perhaps we could become "pen-enemies."

RICHARD J. ROSENDALL
3701 Jeffry Street
Wheaton, Maryland 20906

Let's look at the world as it really is, rather than as we would wish it to be. The greatest force toward global hegemony right now appears to be the multinational corporations. Whether this is a desirable situation or not is a moot point. However, one thing appears certain: whatever *the form taken by an eventual world government, it will be as different from any existing political organization as modern Western democracies are different from feudal baronies.*

Dear Mr. Bova:

True, your Editorials are always at least exasperating, but your August contribution, "Citizens of the World," demands of me this brief word.

You quote, and accept, "First the scientists, then the engineers, the financiers, the businessmen, and finally—'way behind—the politicians."

A dominant characteristic of all science fiction—for me, the great attraction—is its relatively unfettered vision of our world. Indeed, as your Editorial makes clear, to hold a vision of the world—that is, of the world as a single place among others—even this takes a free mind. How then does science fiction's merely "scientific" facet cause you to rattle off such a list of the world's caretakers, and omit the original and perennial citizen of the world—the artist . . .

T. K. ATHERTON
1213 West Main Street
Urbana, Illinois 61801

Good point. But artists—including writers—have had very little direct influence in shaping world society.

Dear Ben:

After reading Dr. Holmes' article "The Split Brain" (August), I started to consider the body/brain complex as a closed loop servo system with the brain acting as the

"decide" or control stage. These control stages are doubled as a "back-up" measure and although they normally function in parallel, each is capable of independent action.

A complex system with multiple inputs and outputs needs frequency compensation to remain stable and this, I believe, is the function of the corpus callosum. Accepting this to be nothing more than a frequency control and switching device for the twin hemispheres gives rise to some interesting ideas such as: sleep, anesthesia, coma or unconsciousness equaling a one-hundred-and-eighty degree phase cancellation; epilepsy, Parkinson's disease or muscle tremors equaling a phase addition with positive feedback leading to resonance. Assuming that external signals can cause the corpus callosum to switch out either hemisphere—say, for example, the left—we have hypnotism, berserkers, emotional blackouts, amnesia, et cetera. If the right is switched out, I am not sure about the results—but how about idiot savants? When both hemispheres are restored to full operation we have the rationalization of irrational acts. This covers post-hypnotic commands where the left is switched out, and in again later. How about the field of mental illness? Could it be that everything from schizophrenia down to simple neurosis is simply the result of the left hemisphere being switched out in times of stress, only to result in confusion when—having been switched back in—the rational left attempts to produce sense from information stored by the irrational right.

Finally, if we consider the corpus callosum as the crossover point, there seems nothing unusual in the

in times to come

Larry Niven's "Borderland of Sol" is the cover story for January's issue, and it brings together two of Niven's best characters: Beowulf Shaeffer and Carlos Wu. John Schoenherr's cover illustration shows the egg-shaped planet Jinx, with its central girdle of atmosphere and airless ends, circling its massive planetary partner, Primary.

Joe Haldeman brings his "Forever War" series to a conclusion in "End Game." Gordon R. Dickson and Barry Malzberg provide a couple of holiday season surprises.

We'll also have the final installment of Alfred Bester's "The Indian Giver," all the usual features, and several more short stories.

left hemisphere controlling the right side of the body and vice versa. Like a pair of scissors, it makes for a balanced system which—as every servo engineer knows—is much easier to control.

ERIC A. WARREN
67, Ramsdale Avenue
Leigh Park
Havant, Hants.
England PO9 4DY

The brain has been pictured as a computer, a chemical complex, even a holographic information system. Viewing it as part of a servo system might be a fruitful line of attack.

Dear Ben:

That is a startling idea: that Big Oil, Big Steel, Big Industry in general, will be the activating force behind world citizenship. (August Editorial) In that case, world government will resemble "1984!"

But I think you are in error about members of the World Citizens' League being without a country. I am a longtime member of both the International and the California League, but I have never been asked to renounce my nationality in the USA, as those who become naturalized in another country are asked to do. (I wouldn't belong under such a requirement.)

In effect, though not technically (and probably, as you say, with little influence) we are dual citizens. Primarily this is an idealistic declaration of belief. Until there *is* a world government we shall continue to be citizens of the nations we were born in.

MIRIAM ALLEN DEFORD

There's no inherent reason for a corporate world state to be repressive, à la "1984." And there will be no effective world government until people are willing to renounce their national citizenships first.

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I HAVE NO MOUTH AND I MUST SCREAM

It was the computer's revenge. In rage, in frenzy, he turned us into monstrosities, imprisoning us deep inside his endless banks. Now I am a great soft jelly thing.

I have no mouth. And I must scream.

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